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INDUSTRIAL-ARTS MAGAZINE

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The Determining Factors in the Evolution of the Industrial Arts in America

Arthur B. Mays, Associate Professor of Industrial Education, University of Illinois.

THE development of industrial arts in the American school system has been continuous, rapid, and full of interesting incidents. Like all great educational movements it has its beginnings rooted deep in a vast maze of social, economic, political, and intellectual tendencies and developments. To state that any single element in the total situation existing in the years just preceding the introduction of manual training produced it, is obviously incorrect. However, there are outstanding conditions and tendencies in the life of the American people during the nineteenth century which are doubtless the immediate causes underlying this radical educational innovation. It is necessary, in order to understand the particular direction given to manual training in its early years, to study some of these conditions.

By the end of the first half of the nineteenth century America was fast losing its frontier characteristics. Roads in the new states and territories were rapidly being built, towns were becoming cities, business was beginning to develop the large corporation, and the rapid improvement in machinery, due to the beginning of the wonderful period of inventions, was giving the country its first real, conscious experience with the great problems growing out of the industrial revolution. The old influence of the frontier, which played so large a part in the lives of the young people of preceding generations, was losing its hold. In an earlier period, if wages were low or working conditions not desirable or an individual was, for any cause, a failure in the centers of population, he had but to move to the frontier and start over in a great undeveloped land of boundless possibilities. Now the possibilities of wealth and advancement in commercial and industrial enterprises were the alluring influences, and in these pursuits skill and technical knowledge played very large parts. It is not strange then that here and there a voice was raised in behalf of practical technical courses in the schools. The discussions of this period took various forms, and it is evident that the economic life of the people was not the only force which was urging the need of technical training on the attention of the schools.

The political and social thought of the times played a very significant part in preparing the ground for industrial arts. The profound effects of the French Revolution with its cry of "liberty, equality and fraternity" had carried over well into the nineteenth century, and the rise of socialism along with the many earlier experiments in utopian communism was felt by America. In all this there was the constant emphasis on equality of opportunity and democracy in social organization. But more significant than all was the growing self-consciousness of this giant young Republic which was founded upon the doctrine of democracy. Such influences inevitably reacted against a traditional type of education which was clearly most undemocratic, both in organization and content. The dignity of labor and the rights of the laboring man were much preached about during these years. Among certain educators also there was, in the earlier part of the century, a similar expression of democratic ideas in the attention given to the writings of European educational reformers.

One of the curious and very significant results of this influence was the manual labor movement which began in the twenties and died out by 1840. This movement[1] has much interest for the student of the history of manual training both because of the idea behind it and because of its character. It grew out of the experiments of Fellenburg in Switzerland and was propagated in this country chiefly through the efforts of two leaders, Joseph Neef and William Maclure. Joseph Neef at one time was associated with Fellenburg in his work in the Canton of Berne, Switzerland, and Maclure was an educational reformer in this country who was trying to interest the schools in the methods of Pestalozzi and of Fellenburg. This movement involved the introduction of forms of manual work, both agricultural and mechanical or technical, into the schools which would make it possible for stu-

[1]Paul Belting, Development of the Free Public High School in Illinois to 1860.

dents, partially or wholly, to pay their way through school. In most cases the students spent one-half day in shop or field and one-half day in the classroom, but this was by no means the only or even the chief purpose behind the movement. Monroe's Cyclopedia of Education in summarizing the arguments for manual labor schools, as opposed to the then existing purely literary schools, states: "(1) They provide a system of education that is natural; (2) they interest the mind; (3) they have good moral effects; (4) they train in habits of industry, independence of character, and originality; (5) they render prominent all the manlier features of character; (6) they give power for acquiring a knowledge of human nature; (7) they greatly diminish the cost of education; (8) they increase the wealth of the country; and (9) they tend to do away with absurd distinctions in society." Thus it is seen that much of the thought behind this movement was of the same character as that which fostered the development of manual training in the eighties and nineties. In commenting on the disappearance of the manual labor movement the writer quoted above states: "Thus the manual training movement of the United States was deferred a half century." Interest in the manual labor movement died out about 1840, but by no means did interest in the idea of making American education more utilitarian and less bookish disappear. Such interest was continuous and very soon was responsible for another significant movement which later had much influence in the development of industrial arts, namely, the movement for the establishment of agricultural and industrial institutes.

The manual labor movement died, not because of inherent error in the philosophy underlying it, but rather because of the unwise efforts of its too enthusiastic advocates to graft it on to a wholly unrelated type of education, and to expect too much from it as a means of financial support for needy classical colleges. In the West where new schools much more in harmony with the basic idea of the movement were established, much better results were obtained and they prepared the way for the land-grant colleges created by the Morrill act of 1862. Dr. Paul Belting[2] in his "Development of the Free Public High School in Illinois to 1860" says: "In the eastern states the feature was short-lived. By 1840, practically all talk of the manual labor idea had ceased, but the West continued the plan to the close of the national period. After the ideas of Maclure and Neef had subsided, J. B. Turner of Illinois College, where the system was in operation for a few years, somewhat changed the arguments to those that should favor institutions from the common schools through the university for the education of the laboring people. His life was spent in continuous service to that ideal until Congress passed the land-grant act for the establishment of agricultural and mechanical colleges, and Illinois chartered the Industrial University. Thus the manual labor idea in Illinois had served as a basis for the more liberal education of all the people, not only for the professions but for all classes. The final realization of many of the aims of the original advocates of manual labor came with the introduction of manual training in the high schools about 1877."

However, a score of years elapsed after the passage of the Morrill act which established agricultural and mechanical colleges, before the beginning of the type of work we know as industrial arts. These years were years of discussion of the value of industrial and agricultural education and experimenting in methods of organizing and teaching technical subjects. Since these discussions and experiments are the very soil out of which the industrial arts movement sprang, they are of much significance in any study of the history of industrial arts in America.

The organization of the land-grant colleges greatly increased the number of teachers giving their full time to the development of industrial education, and a constantly increasing general interest in the problems involved in training for industry was clearly evident. During the seventies and eighties the industrial developments in America were almost startling in magnitude and rapidity, and the consequent increasing demand for skilled mechanics and engineers was an ever-present reminder of the inadequacy of the American educational system to meet the needs of the country. President White of Purdue University said in 1880: "The increasing demand for better work has been attended by a steady decay of the apprenticeship system, which hitherto has been our chief reliance for the training of artisans. It is becoming more and more evident that if this decay of apprenticeship is not made good by technical training in some efficient form, the American manufacturer will be at the mercy of the skilled labor of Europe******. The day of muscle in industry has passed and the day of mind with skill of eye and hand has dawned."[3] Strangely enough, the educational leaders in the seventies and early eighties seemed not to distinguish clearly between engineering education and trade training at the lower levels. Much of the confusion of terminology and of counsel of the period was due to this fact.

Another very significant attitude which prevailed was that of avoiding always the appearance of *specific vocational training.* This attitude seems to have characterized to some extent even such schools as Purdue University and the Massachusetts Institute of Technology and explains in large measure the enthusiastic reception accorded the "Russian System" of shop work. At the time this system was discovered, the outstanding advocates of industrial education were earnestly search-

[2]Paul Belting, "Development of the Free Public High School in Illinois to 1860." Chap. VI, p. 78.

[3]E. E. White. "Teacher Training in American Schools." Education, Nov., 1880, p. 114.

ing for some method of teaching mechanical processes which would be practical, but at the same time could be handled under traditional school conditions and would be sufficiently "general" and "fundamental" not to do violence to the popular conception of the function of a school or of a college. It is noteworthy that when Dr. Runkle, the president of the Massachusetts Institute of Technology called attention to the remarkable exhibit of shop exercises at the Centennial Exposition in Philadelphia made by Russian engineering students, he and the other leaders in industrial education were most enthusiastic over the thought that such work was *"fundamental"* to all forms of shop work. At last they felt they had found a type of shop work which was worthy of being placed in the school because it was not specific trade training but *general* mechanical training. The enthusiasm manifested over this idea both by the technical college men and, a little later, by Dr. Woodward and the high school men, is of great significance in the subsequent development of industrial arts in the United States. Dr. Nicholas Murray Butler said of this,[4] "The Russian experiment was made known to the people of the United States in 1876 by Prof. John D. Runkle, then president of the Massachusetts Institute of Technology. In his annual report for 1876, Prof. Runkle gave an elaborate account of the Russian system and pointed out its application to the work of the institution over which he presided. In consequence a School of Mechanic Arts was added to the equipment of the Institute. In 1879 the St. Louis Manual Training School was organized and the subject of manual training was formally put before American educators for investigation and criticism. Both the Boston and the St. Louis experiment, however, only suggested the real question at issue—they did little or nothing to solve it. They made it plain that for boys of high school age manual instruction could be devised that would be practical yet *disciplinary, educational not technical."*[4]

Very early the discussions turned on the question as to whether *any* form of industrial training should be given in the public school. The constant demands in industry for skilled workers, however, soon converted this question into one of how to give training, or rather, what kind of industrial training should be given in the public schools. The pronouncements of educators in the early eighties on this question are full of interest to the student of education today. The great fear seemed to be not that the schools would fail to do their full part but that they would do it too well and violate the then current philosophy of public education, which was that specific vocational training is no part of the proper function of the common schools. Quoting again from E. E. White of Purdue University, in a discussion in 1880 of the question of the introduction of some form of industrial training into the common schools we find: "The state has the right to teach any branch of knowledge that will promote the public welfare******. The right of the state to teach all knowledge does not necessarily make such instruction its duty. The primary and important duty of the public school is to provide training and to teach knowledge of general application and utility. It recognizes no class distinctions, social or industrial, but provides a general education for all classes of youth. It is a *common* school, a school designed to impart a common education—an education open to all and useful to all. The elements of technical knowledge which are of general application and utility may clearly be taught in the public school. These may include instruction in industrial or mechanical drawing, the practical applications of geometry, the keeping of accounts, the elements of the physical and natural sciences, modelling in clay, and those elementary mechanical processes which may be made an efficient means of general training. Such instruction is not only the basis of technical training but is of great value to all youth whatever may be their occupations and positions in life. It is useful as a general preparation for all pursuits. Time for this instruction may be gained by reducing the time hitherto devoted to several other branches of study******. The technical instruction above indicated may properly be called *general* in distinction to that which relates to a particular trade or pursuit which is special. Should this special technical instruction be made an integral part of the work of the public school? In the light of the principles above stated, I unhesitatingly answer, No. It is not the duty of the public school to teach trades******."[5] This extended quotation from one of the leading advocates of industrial education during the eighties gives a typical statement of the attitude of the educators favoring such work in the public schools. It is interesting also to note that President White advocated the development of higher technical schools by state and municipal aid, as well as the granting of state and municipal subsidies to establish special technical schools. It is also very interesting to find that at that relatively early date he advocated co-operative part time classes for children over twelve years of age. Outstanding men were equally emphatic in their insistence that only *"fundamental"* or general forms of industrial training should be tolerated in the public schools. Dr. Nicholas Murray Butler said in 1888: "Industrial education is an education in which the training of the pupil's powers of expression goes on side by side with the training of his receptive faculties and in which the training of both is based on a knowledge of things and not of words merely. Industrial education is not technical education, though many persons confound the two. Technical education is a training in some par-

[4]Proceedings, American Institute of Instruction, 1888. (The italics are the writer's.)

[5]Proceedings, N. E. A., 1880, p. 223.

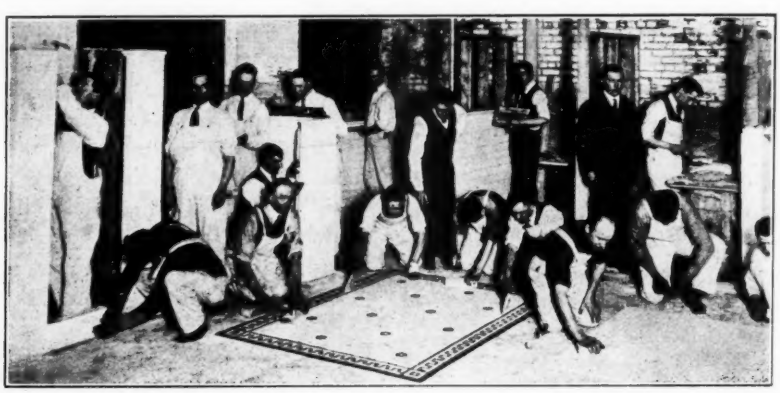
ticular trade or industry, or set of trades or industries, with a view to fitting the pupil to pursue it, or them, as the means of gaining his livelihood******. It takes for granted a general education and builds upon it as a foundation. Industrial education on the other hand is the foundation itself. It is the general and common training which underlies all instruction in particular techniques."[6] Charles R. Richards in 1890 in speaking of the earlier period says: "In the early agitation for the introduction of manual training in the eighties the aims put forward for the new subject as evidenced in the discussions of the N. E. A.****were in the main based on the conception of formal discipline. Manual training was entitled to a place in the school because it exercised the observation, trained the reasoning powers and strengthened the will."[7] "Although it is doubtless true that public support of the new movement was due to a vague but sincere conviction that the introduction of handwork stood for industrial training, educators as a rule most carefully refrained from advancing a claim for utilitarian value in the work and all utterances were for the most part expressed strictly in terms of the prevailing faculty psychology." The importance of these earlier opinions to present-day discussions doubtless will justify some further quotations. In a description of the new domestic science courses at Lasell Seminary, a girls' school near Boston, the statement is made: "Lasell does not aim to make cooks and dressmakers, but rather to strengthen the whole texture of women's life, and to dignify the domestic industries by allying them with culture."[8] Of special interest is this part of a paper by L. S. Thompson, read before the Industrial Education section of the N. E. A., in 1881. "We cannot revive apprenticeship if we would and perhaps we would not if we could. What we propose to do in the common schools is that we give a technical or practical *tendency* to all our teaching******. Versatility is the great need of the laborer in this age of machinery so that when some machine is invented that does his work better and more rapidly than he can do it himself, he may be able either to run the machine or turn his attention to something else. A general education such as is given in our common schools and colleges by teachers who understand and insist upon the practical bearings of what they teach, best fits the laborer for turning from one vocation to another. A special education in the narrow and extensive sense of that word unfits him for such a change."

In this way, the great period of discussion and experimentation which lay between the establishment of the land-grant colleges and the rapidly growing acceptance of manual training in the nineties shaped the character and determined the philosophy of handwork in the public schools. As will be seen later, several significant influences entered to redirect it and to shift emphasis from time to time but, in the main, these early ideas, somewhat revised to accord better with a more modern psychology, remain as the heart of the high school and grade work in present-day practical arts.

A summing up of these ideas reveals that back of them lay two powerful influences, namely, (1) the awakening interest in educational method and reorganization which was characterized by renewed interest in the work of the great educational reformers, and (2) the tremendous expansion of American industry with the consequent breakdown of apprenticeship and the shortage of skilled labor. It was most unfortunate for industrial arts that the schoolmen and the taxpayers were thinking and talking in different terms during those years. This misunderstanding reacted on industrial arts later and many of the difficulties then encountered in its development, which might have been cleared up, are present in identical form today.

(To be Concluded.)

[6]Proceedings, American Institute of Instruction, 1888, p. 217.
[7]Proceedings, N. E. A., 1910, p. 678.
[8]Proceedings of. N E. A., 1881, p. 243.



Tile Setting Class in the Evening Vocational School, Newark, N. J.

Mechanical Drafting for Second-Year High School Classes

John F. Faber, Chairman of Committee on Mechanical Drafting Course, Erie, Pa.

THE satisfactory completion of the drafting course, as outlined in the first year's work, published in the January, 1923, issue of the Industrial Arts Magazine is considered a prerequisite to this course.

An attempt has been made to outline a practical course of study suitable for individual rather than group instruction.

The aims as set forth in the Committee's Teachers' Manual are:

a. To teach the reading of complicated drawings in third angle orthographic projection.

b. To insist upon the making of neat, intelligible instrumental drawings to scale, to within 1/64 of an inch.

c. To teach the making of complicated sketches of detail and assembly machines.

d. To insist upon neat, legible letters and figures as an aid to neat drawings, as taught during the first year.

CHART

№4

SHOWING LAYOUT OF WORK TO BE COVERED IN MECHANICAL DRAFTING FOR SECOND YEAR HIGH SCHOOL CLASSES

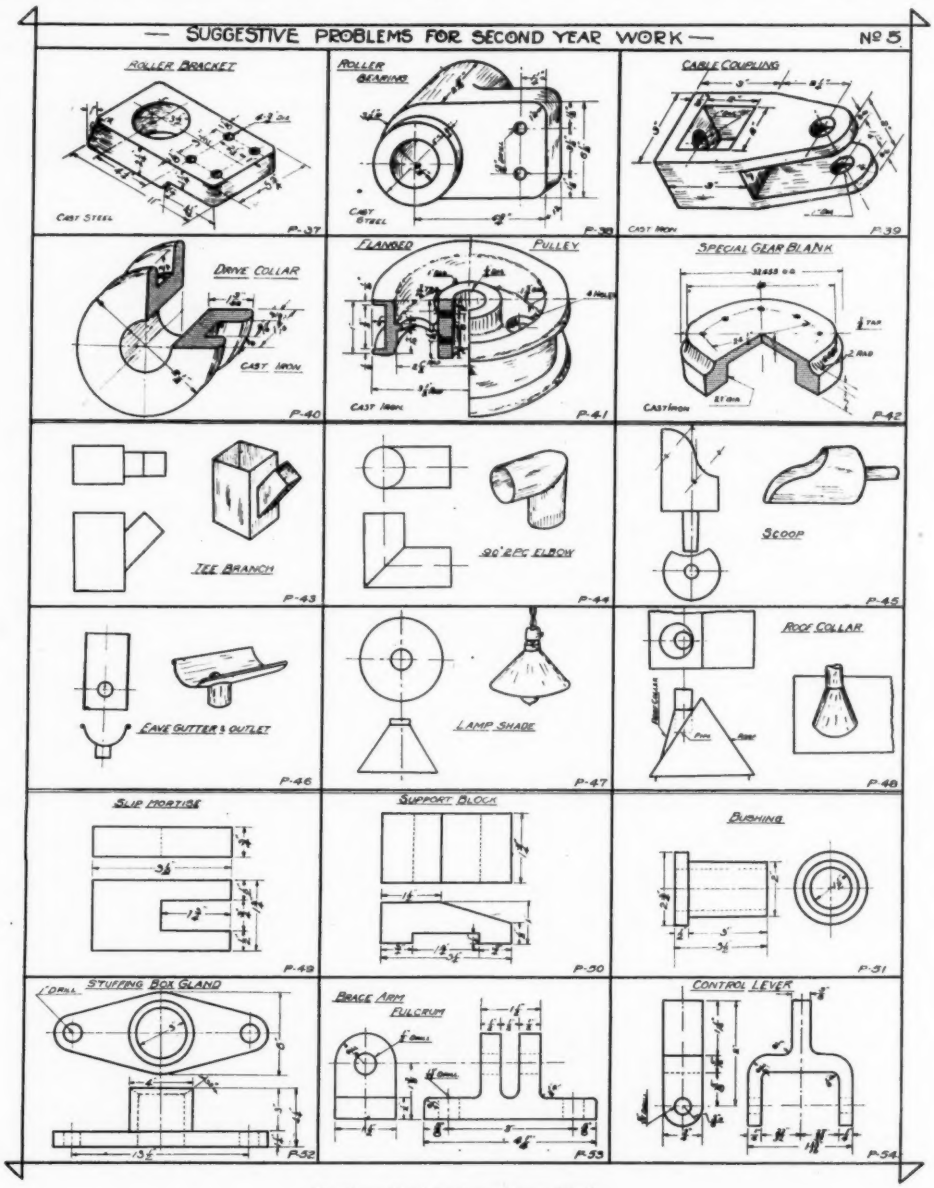
MONTHS	FIRST WEEK	SECOND WEEK	THIRD WEEK	FOURTH WEEK	
SEPT.	REGISTRATION, SEATING EXPLANATION OF ROUTINE FOR NEW STUDENTS LETTERING PRACTICE	BRIEF REVIEW OF ELEM. ORTHOGRAPHIC SKETCHING AS TAUGHT 1ST YEAR. LETTERING PRACTICE	BRIEF REVIEW OF INSTRUMENTAL DRAWING AS TAUGHT 1ST YEAR LETTERING PRACTICE	BRIEF REVIEW OF WORKING DRAWINGS AS TAUGHT 1ST YEAR LETTERING PRACTICE	REVIEW
OCT.	TEACH- INTERSECTION & DEVELOPMENT OF RECTANGULAR OBJECTS	TEACH- INTERSECTION & DEVELOPMENT OF CYLINDRICAL OBJECTS	TEACH- INTERSECTION & DEVELOPMENT OF CONICAL OBJECTS	TEACH- TRUE LENGHTH IN CONIC SECTIONS	INT & DEVEL.
NOV.	COMPLETE PROBLEMS STARTED OR GIVE TEST	TEACH- DRAWING AND NUMBERING OF EACH DETAIL ON A SEPARATE SHEET HAVING A KEY OR PARTS LIST SHEET		TEACH- GROUPING OF DETAILS ACCORDING TO THE FUNCTION THEY SERVE ON MACHINE - AS TAILSTOCK DETAILS	MACH. DETAILS
DEC.	SAME AS NOV- 4th WEEK	TEACH- DRAWING OF ALL DETAILS ON ONE LARGE SHEET, HAVING KEY OR PARTS LIST IN LOWER RIGHT CORNER		TEACH- ISOMETRIC OR PERSPECTIVE SKETCHING OF RECT. OBJECTS	ISOMETRIC OR PER. SKETCHING
JAN.	TEACH- ISOMETRIC OR PER. SKETCHING OF CYLINDRICAL OBJECTS	TEACH- ISOMETRIC OR PER. SKETCHING OF PARTS OF CIRCLES	TEACH- ISOMETRIC OR PER. SKETCHING OF LARGE CURVES	TEACH- USE STEEL SCALE; INSIDE, OUTSIDE & TRANSFER CALIPERS	SHOP SKETCHING
FEB.	SAME AS JAN- 4th WEEK	TEACH- USE OF COMBINATION SQUARE AND TO MEASURE HOLES OF SAME DIA. ℄ TO ℄	TEACH- USE OF PLUMB BOB IN SKETCHING	SAME AS MONTH OF MAR.	
MAR.	DRAW FROM SKETCHES MADE IN SHOP IN PREVIOUS UNIT OR DRAW ANY SIMPLE MACHINES NECESSARY FOR USE IN SCHOOL SHOPS				ADV. MACH. DETAILS
APRIL	SAME AS MONTH OF MARCH		TEACH- ASSEMBLIES HAVING NO INVISIBLE EDGES SHOWN & CATALOGUE ASSEMBLIES		ASSEMBLY DRAWING
MAY	TEACH- ASSEMBLIES SHOWING OVERALL DIMENSIONS & DIAMENSIONS ℄ TO ℄ LAYOUT AND DETAIL WORKING ASSEMBLIES		TEACH- SECTIONAL ASSEMBLIES		
JUNE	TRACE AND BLUEPRINT ANY DRAWINGS NECESSARY FOR SCHOOL SHOPS OR DRAFTING - ROOM FILES				TRACING AND BLUEPRINTING

Acknowledgment. The Problems shown on chart No. 5 and on charts No. 2 and 3 in an article on "First Year Mechanical Drafting for High Schools," published in the January, 1923, issue of the INDUSTRIAL-ARTS MAGAZINE, were taken for the most part from the following textbooks: Mechanical Drawing for High Schools by French & Svensen (McGraw-Hill Book Company); Engineering Drawing by French (McGraw-Hill Book Company); Mechanical Drawing for Secondary Schools by Crawshaw & Phillips (Scott Foresman & Co.); Mechanical Drawing by Jones (Industrial Press); Constructive Drawing for Secondary Schools (Atkinson Mentzer & Co.); and Mechanical Drafting by Miller (Manual Arts Press). These books are used as text and reference books in the Drafting Rooms of the Erie schools. John F. Faber.

e. To teach the making of assembly drawings from detail sketches or drawings.

f. To insist upon neat tracings and the taking of blueprints as taught during the first year.

g. To teach the making of machine detail drawings from machines or dimensioned assembly drawings.



Problems Used in Second-year Work.

h. To familiarize the student with the use and application of simple tables found in handbooks.

i. To teach the pictorial representation of objects from orthographic drawings.

Complying with the above aims the subject was divided into short units as follows: Review, intersections and developments, machine details, isometric or perspective sketching, shop sketching, advanced machine details, assembly drawing, tracing and blueprinting. These divisions and the time alloted to each are indicated on chart 4 by heavy lines.

Each week represents four hours' work.

Review

Second-year classes usually start in September after the summer vacation and the personnel of the class might be made up of pupils from other teachers, schools or cities. For these reasons it was considered advisable to devote the first four weeks to a general review of the requirements for graduation from the first-year course. This will provide for a possible registration the third or fourth week and allow the new students to become adjusted to their new environment.

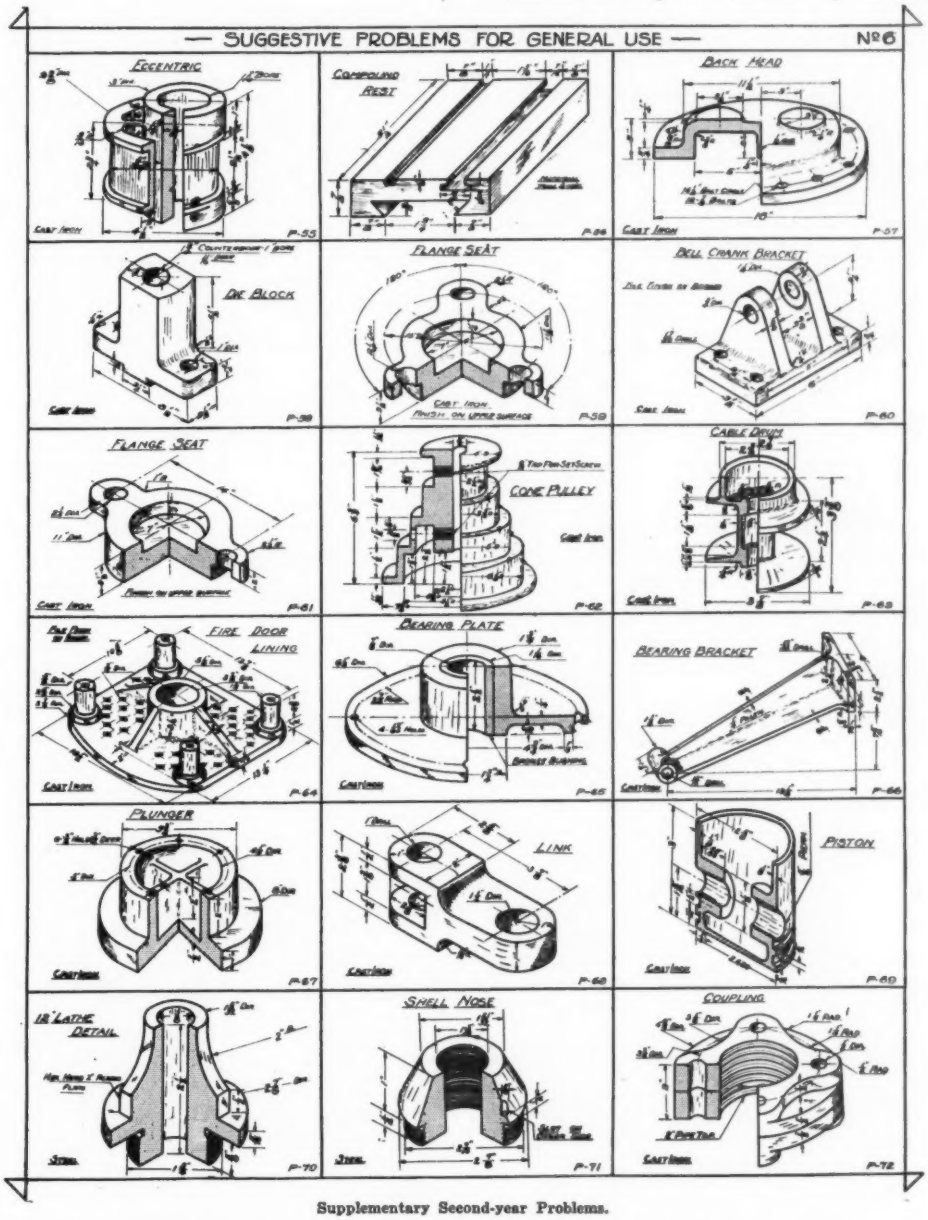
Intersections and Developments

This phase of drafting plays an important part in some drafting rooms but is not so important that

it need be studied in detail. The intersections and developments for the simple sheet metal objects are taught, emphasizing the constructions which might be encountered in regular shop drawings. The aim is to cover the field in a general way, leaving the more complicated developments to the sheet metal trade drafting course.

the object or dimensioned assembly drawings. Small drawings for the school shops are handled during this unit.

The different practical methods of grouping and listing details are taught before the students start work each week, as outlined. No student could possibly make the detail drawings of a machine by the three methods



Supplementary Second-year Problems.

Suggestive Examination

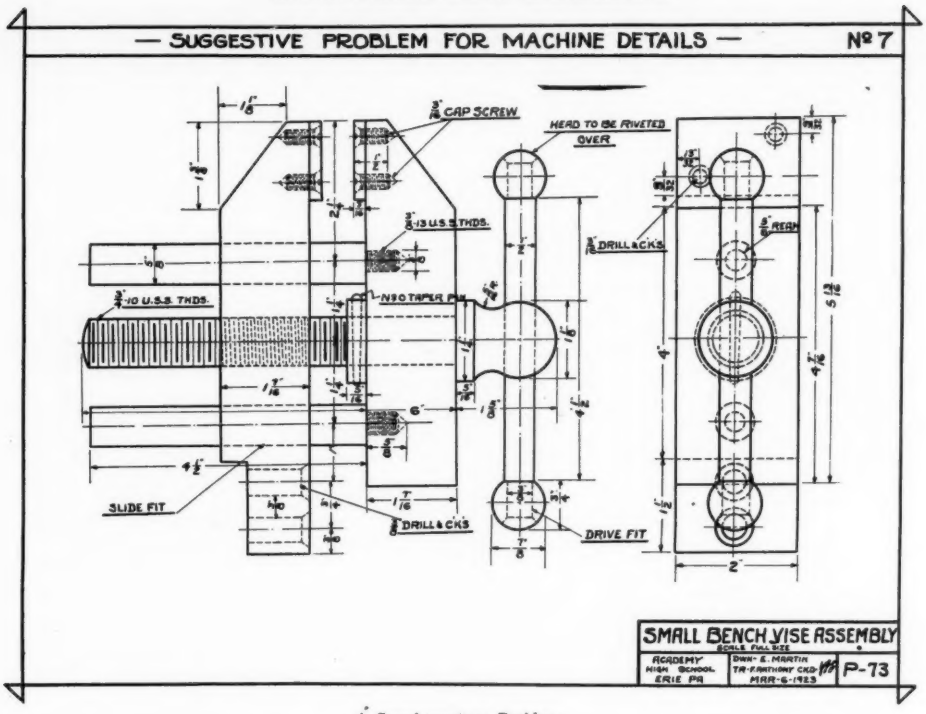
1. What mechanic specializes in the principle of intersections and developments?
2. What kind of objects can be developed?
3. What kind of objects cannot be developed?
4. What is meant by the term "development of a surface?"
5. How many pieces of sheet metal are necessary to make a box 1"x2"x6", without cover?

Machine Details?

The work in this unit consists of making drawings of separate details of a simple machine, to scale, from listed, in the allotted time, and this is not expected. Each student is assigned one method and through class instruction or observation the different methods are brought before each member of the class.

Suggestive Examination

1. What is meant by a detail of a machine?
2. How are details of a machine usually grouped?
3. What is meant by a key, or parts list sheet?
4. How many parts of a machine are shown in a detail?
5. Should all the details of a machine be drawn to the same scale? Why?



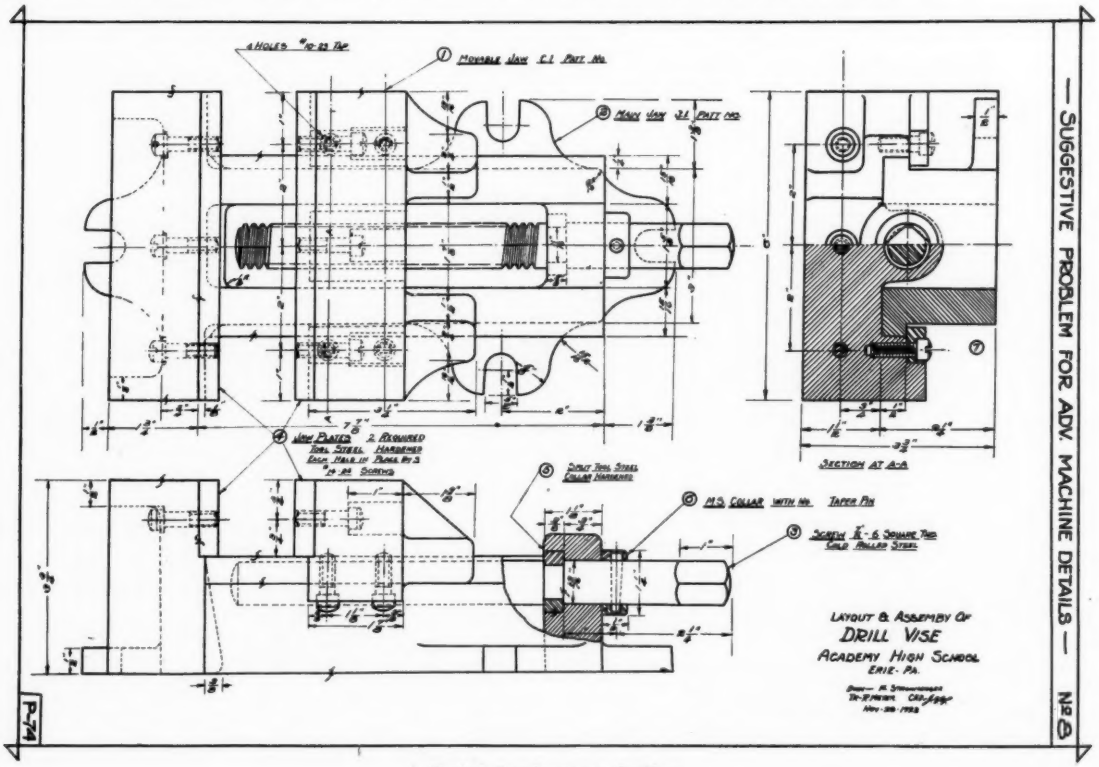
A Supplementary Problem.

Isometric or Perspective Sketching

The ability of a mechanic or engineer to picture his ideas quickly to one not familiar with orthographic projection is sometimes quite necessary and is an aid in clearing up difficult problems.

The aim of this unit is not to make pictorial drawings with instruments but to develop the ability to sketch pictorial representations from memory or orthographic drawings. It shows quickly whether or not the student understands shop drawings of two or more views.

The selection of isometric or perspective sketching is left to the discretion of the instructor. In either case the same results are obtained.



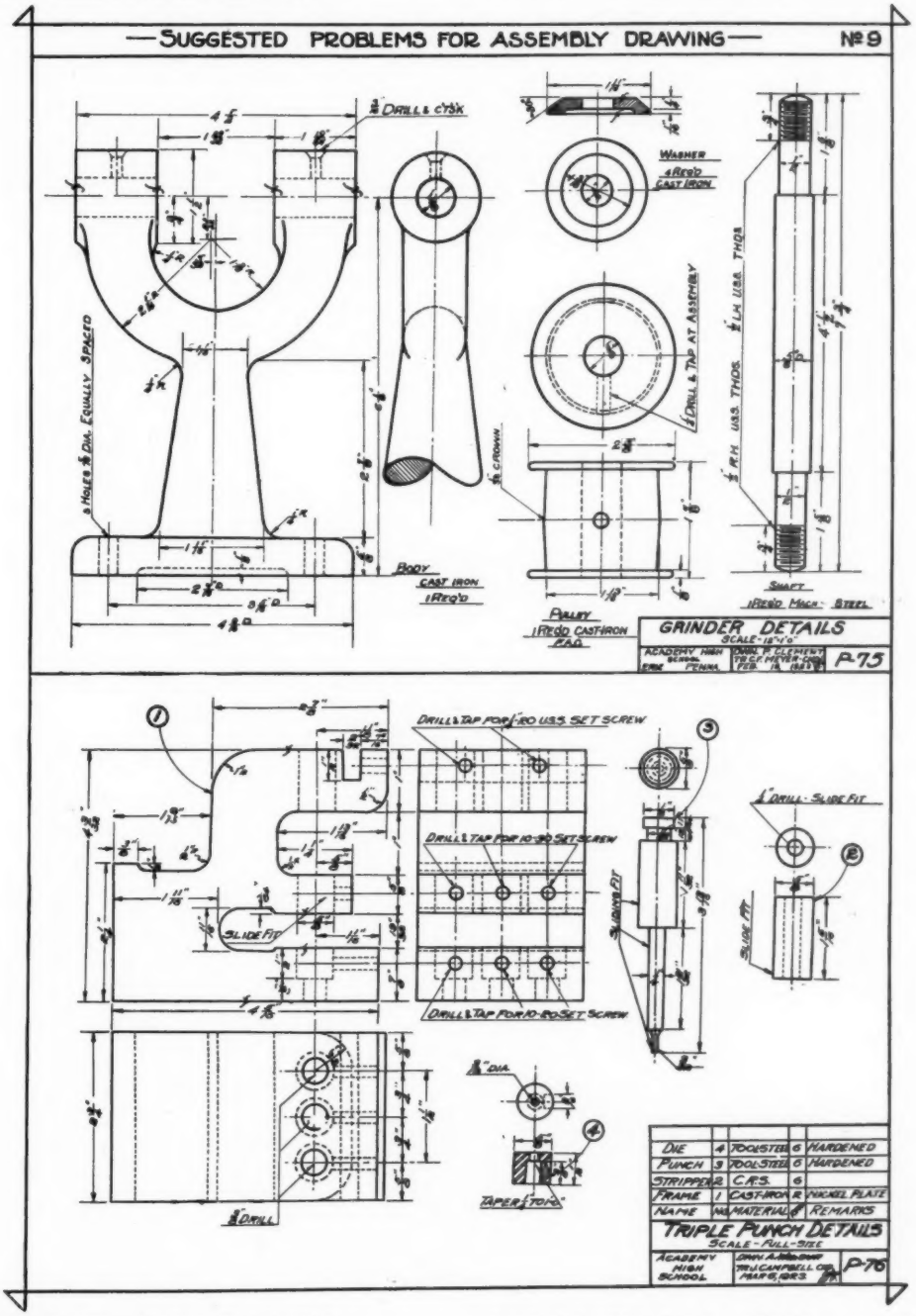
A Typical Supplementary Problem.

Suggestive Examination (Isometric)

1. At what angle are the horizontal edges of the object sketched in an isometric?
2. Why do isometric drawings appear distorted in places?
3. What is the difference between an isometric drawing and a working drawing?
4. How does an isometric differ from a perspective?
5. How are isometric circles sketched?

Shop Sketching

The importance of this unit is particularly stressed, for it is conducted in shops and is representative of the everyday sketching of all mechanics. Sooner or later the shop man is called upon to produce a sketch and many times his familiarity with this branch of



Suggestive Examination (Perspective)

1. How does a perspective drawing differ from a working drawing?
2. What is meant by foreshortening?
3. Is it better for a mechanic to work from a working drawing or a perspective? Why?
4. Is it practical to draw a complicated machine in perspective?
5. How are perspective circles sketched?

mechanical drafting has brought him promotion.

In some instances complete machines have been taken apart and sketched. It has been found instructive to have a different boy sketch each different machine detail and one or two sketch the assembled machine. The result of this procedure is that accuracy

of measurement is found to be important and that, to be of value, the details must fit each other when completed.

To encourage this carefulness, some of the sketches were exchanged in the drafting room, each boy working from another's sketch. This not only strengthened the realization of correctness but taught the student to work from submitted sketches.

Most school systems have machines or machine parts which might be sketched, but at times it is impossible to have enough material on hand for this unit. In this case, the cooperation of the manufacturing plants of the city might be solicited and arrangements made for visits and sketching in these plants. This affords an excellent opportunity to acquaint the class with commercial shop practice and brings it in contact with the present-day problem—*production.*

Suggestive Examination

1. Should notes and dimensions on a sketch be lettered or written? Why?
2. What tool is used in measuring the diameter of a shaft?
3. What tool is used in measuring a bored hole?
4. What is the most important step in producing the drawings of a machine?
5. When is a combination square used in sketching?
6. How is a plumb bob used in sketching?
7. How are holes of the same diameter measured, center to center?
8. Is shop sketching valuable as a study to the high school boy? Why?
9. Why is it better to sketch in the shop than in the drafting room?
10. Why are dimensions over 24" usually lettered in feet and inches?

Advanced Machine Details

This unit is devoted to making the detail drawings of machines from the shop sketches made in the previous unit.

At this time, the practical side of shop drawings looms up more than at any previous time during the two years' course. The terms bore, core, ream, tap, various fits, kinds of finish, etc., play an important part and serve a definite meaning to the student. Again, handbooks must be consulted which act as technical information for any shop in which the boy might be employed after leaving school.

Very often machines or machine parts need repairs or replacements. In a school system provided with a pattern and machine shop these might be drawn and the student given the opportunity to see the completed machine or part. The value of showing a class the routing of a job from order to completion cannot be stressed too strongly. This development is all the more realistic if the student has participated in the making of the drawings or even the drilling of a hole.

When no sketches or machines are available for this unit, dimensioned assembly drawings of a more complicated character are supplied. A suggestive problem for this unit is shown on chart 8.

Suggestive Examination

1. When should the term "bore" be used in reference to a circular hole? When "drill?"
2. What is a lug? A boss?
3. What is meant by spot face? When is it used?
4. Why and when are holes reamed?
5. Why and when are handbooks referred to in a drafting room or shop?

Assembly Drawings

The different kinds of assemblies are shown to the class and each kind stressed for a few minutes at the beginning of the week, as outlined on chart 4. As in the study of machine details no one student is required to make each kind of an assembly drawing but each member in the class or group will be assigned one kind. In this way all kinds can be made.

As in the previous unit, any assemblies needed for school use are handled at this time.

Suggestive Examination

1. What is an assembly drawing?
2. For what purposes are assembly drawings used?
3. How many kinds of assembly drawings are there?
4. When should shading be used in assembly drawings?
5. Is it practical to furnish the shop with a dimensioned assembly drawing and no detail drawing?

Tracing and Blueprinting

The principles of tracing and blueprinting were studied in detail during the first year. For this reason no teaching should be necessary at this time. The work covered by this unit is outlined on chart 4.

Suggestive Problem Chart

Charts 5, 6, 7, 8 and 9 are merely suggestive of the kind of problems used in connection with the course of study outlined.

The arrangement of these problems is based upon chart 4, as follows:

P-37 through P-42...Review.
P-43 through P-48...Intersections and Developments.
P-49 through P-54...Isometric or Perspective Sketching.
P-55 through P-72...General Suggestive Problems.
Chart 7 and 8.....Machine Details.
Chart 9.....Assembly Drawings.

The drawings and tracings for these charts are the work of high school students. The pictorial representations were made from commercial shop blueprints. The detail and assembly drawings were originated in the writer's classes.

Flexibility of the Course

The second-year course described, shown on chart 4, requires special work at a specific time. However, in actual class work, conditions at times, prevent this procedur The drawings of a broken machine part, special drawings, or taking of blueprints are taken care of any time during the course.

A class progress chart is used to show that each student has completed and it is possible to complete the last unit before the third or fourth. At the end of the year, however, each sudent should have credit for all units listed.

This flexibility takes care of the individual differences, conditions which might arise to hamper a stereotyped course of study, and allows for individual rather than class instruction.

NOTE—The organization chart used in outlining the drafting courses and other courses in Erie was designed by Wadsor M. Scoville, Supervisor in Industrial Teachers' Training Department, State Normal School, Oswego, N. Y.

Teaching Design

Edward J. Lake, Head of the Department of Art and Design, University of Illinois.

IT IS evident that the study of the design of things actually made in the shops by pupils is not enough to impress the precepts and principles of design which is a distinctive purpose of the manual arts as a school subject.

Design must be impressed by a course of study which brings under attention interests that are not involved in a few objects such as can be made by each pupil under school conditions.

The constructive use and structural limitations of woods, metals, ceramics, cements and textiles must be involved. The texture and color of the materials are involved in their proper use.

No school subject can impress the proper use of such a variety of materials by actual making. Design must, therefore, be taught in part through the study of things already made and illustrated to the pupils by pictures or objects that are available.

Design must be carried through a course of study.

Since design is the expression of purpose in visible form, the first step in the formulation of a design, or in the study of a design already formulated, is to establish a purpose. Every study of design should be approached under carefully stated specifications of purpose, materials, manner of construction, and treatment or finish.

How can a design be made for a vague purpose? Every project should be clearly and definitely defined by specifications, the first of which should be a statement of purpose to which the design is directed. Here lies one great opportunity for the teacher to lead the pupil to the exercise of reason and propriety that makes design teachable. That teacher or pupil of the manual arts who in humility and despair confesses that he knows nothing about art, may discover that the careful and logical adjustment of materials to purpose, results in design of a high order. Poor design is invariably illogical.

The right thing in the right place and a place for everything needed, is the solution of every design. Every well-designed thing is useful and looks useful.

We have listened too long to the enthusiast over aesthetics who cherishes the unique effect over the well ordered and logical composition. Good taste is based on good judgment. Good judgment must be keen judgment and well supported with information. Information with regard to cause and effect is available to every teacher and pupil of the manual arts. It should be the content of every course in the manual arts.

We have set up distinctions as to kinds of design adapted to different purposes of education. We have given the name of pure design to the composition of forms that have no distinctive meaning and are arranged to the best effect in tones, lines, shapes, accents, sizes, colors and textures. We have given the name of applied design to these same elements of effect when adjusted to some fabric, tile, panel, pottery or utensil. We have given the name of structural design to the putting together of mechanical forms in the devising of useful objects. There are precepts that govern each of these kinds of design and there are principles that govern all of them. Every good design must have unity, balance and harmony.

The idea expressed by the design must be set apart from other conceptions by unity. The parts of the design must be related by balance and harmony. These fundamental principles are employed in the expression of any idea be it song, sermon or settee.

Teachers of design in the manual arts have not as yet made use of the aesthetic and the practical as organic qualities. There should be no conscious distinction between the aesthetic and the practical. Feathers do not present the only distinctive aesthetic interest of birds. The aesthetic and the functional properties are so involved in every created thing that to design properly one must consider all conditions of design in the expression of purpose.

I need not review the many precepts of structural design to teachers who are using them. Better, perhaps to emphasize some of the impressions that should result from instruction in design and suggest means by which these impressions may be impressed.

The person who uses interest in design must know how to transpose interest. Interest is transposed most certainly by sequence. The transposition of interest in design is from the dominant interest to related interests and always back to the most significant interest of the whole composition.

Parallel vertical lines transpose interest upward rather than downward. Parallel horizontal lines transpose interest to the right or left with equal force. Curved lines transpose interest from least to greatest curvature.

Understanding of these positive uses of lines in design can be impressed by reference to effects of lines in nature and design. A sequence from large to small indexes interest and can be used effectively in the composition of structural forms to control attention. A sequence from dark to light directs interest and relieves from a sense of compression in design as it does in our experience with natural or artificial lighting. Any sequence of attractiveness directs and governs interest, and the control of interest is necessary to the composition of everything designed for a purpose.

The study of the transition of interest in design is not difficult to direct. Ask pupils what they see first in a design and there will be a general concensus of impression. The interests of several persons will not follow the same course through a design because in most designs there are secondary interests that are equal or nearly so. Transition of interest there must be, and in a well composed effect the method and purpose of directing interest is evident for study. Knowing how to transpose interest gives a ready means of unifying, balancing and controlling effects in composition. For example, it is frequent that a form is of necessity divided into two equal horizontal parts. I have in mind a building in which the first and second stories are equal and a belt course is placed between them in accordance with the style of the design. Like windows in these two stories and a like treatment of the walls would have resulted in a poor effect. The designer has united the upper and lower stories adequately by the simple device of treating the lower windows with lintels and the upper windows with arches, giving a continuity of interest from below upward that carries through the belt course and unifies the design.

Most desirable proportions can rarely be used in structural things but the effect can always be made excellent by a suitable transposition of interest, and adjustments of accents.

The most difficult problem of teaching design is to develop ability to think of the design as a whole. I believe this can be done best by studying the problem of primary mass and general composition under the specifications of purpose, in several small size, freehand sketches. It is well to emphasize the difference between dimension and proportion. Certain dimensions are usually arbitrary in constructive problems. Chair seats and table heights must be of certain dimensions. These dimensions are subject to a variety of treatment in their proportion to other sizes of the object. A study of proportion is therefore not dependent on scale. The composition of large objects can be studied without reference to scale, and at a small size to which dimensions can be applied after the composition is decided upon.

A fine sense of proportion may never be developed by learning dimensions that are theoretically in good proportion. The golden proportion like the golden rule is a statement of ideal which is independent of conditions. We live and work under conditions and must develop a judgment of effect under the conditions of each problem that comes to us.

Probably the nearest approach to a definition of good proportion is harmonious dimensions. When the sizes or dimensions that are evident in a composition have something in common but are not readily seen as equivalent or commensurable, they are pleasing in proportion.

Similar proportions in the various parts of a design insure harmony. To secure similar proportions in the various parts of a design, rectangles may be made with parallel diagonals and accents may be placed on the projected diagonals of established rectangles.

This is a practical test which may serve as a guide in the layout of a design. It should be used with discretion, however, for good proportion, like most good things, loses charm if the method is conspicuous.

A judgment of proportion as expressive of the character and strength of materials directed to the use of the object designed, is necessary in design. A well-proportioned tea set or candle-holder in pottery would not have the same proportions as the same objects well designed for metal. The teacher who has become acquainted with the use of different materials by actual craft work can at least call attention to effects in various materials and a study of them through design can be made.

The fact that a great number of kinds of material cannot be used in the shop and a great variety of things cannot be made in the shop does not relieve the manual arts teacher of the obligation of teaching effects in these materials and objects. In most communities there are buildings that offer a study of design in various materials and for various uses.

Every school pupil is a prospective judge of buildings if not a prospective builder. A knowledge of the characteristics of style in building is not of first importance. Understanding of the effect of a building as expressing purpose is of great importance. All monumental structure resolves into three functional divisions in height. There is at the bottom a base on which the structure rests; next a superstructure of walls or shaft, then at the top a frieze and cap, or cover, or roof, or finial that completes the composition of every monumental structure.

This division of structural things that stand on a horizontal plane is fundamental and should be emphasized as such. It is the prototype of everything that grows; roots, trunk and foliage; roots, stalk and flower; base, shaft and capital. The inevitable order of design in structural design satisfies our sense of fitness and propriety in structural things.

Which is it best to present to a class of prospective designers; a so-called rule of design or the conditions on which that so-called rule is based? I am inclined to believe that the greatest educational value comes with the process of reasoning from premise to conclusion rather than from the blind acceptance of a doubtful rule and the application of it. I should, therefore, suggest that the prospective designer be informed of the conditions of a design and discover rules for himself if there be any.

We are given a rule in our design texts that reads like this: "If the primary mass be divided into three horizontal parts the middle part should be dominant and the upper and lower divisions unlike." This rule, as stated, is based on the analysis of things resting on

a horizontal plane with a base; rising to prominence with a superstructure; and finished at the top with a finishing member. How would it apply to the design of a goblet; or a lamp standard; or a pendant object? It is evident that the division of three may well apply, but it is also evident that the dominance may not well be placed on the middle division in all cases. In structural design the middle division of the three is often a transitional or connecting member of the design and should not be made dominant.

Again, we are given a rule to this effect: "If the primary mass is divided into three vertical divisions, the center division should be the larger, with the remaining divisions of equal size." Here the word size is used in place of dominant.

Perhaps it is a mistaken word; for certainly no one who has noted the way in which dominance is secured by placing the most attractive but often the smaller unit at the focal center to secure, balance, would restrict the designer by a rule insisting that the central of three horizontal interests should be the largest.

As a fact, balance may be secured in so many ways that no rule will apply except the one definition of balance which is the equalization of interests over the focal center.

The distinction between formal and informal or symmetrical and unsymmetrical balance should, of course, be noted and each form of design should be studied and experienced by students of effects in the manual arts. It is not adequate that our pupils should be confined to formal design because most of the objects made by them in the shop are symmetrical. The range of interests involved is increasing and we are designing things that go and should look as if they could go. We are designing toys and machines and utensils that are not symmetrical.

At least we are making them and by educational obligations we should be designing them before we make them.

Objects that are designed to move in a given direction are designed out of balance over the focal center of the primary mass. At this time when the very population of the earth seems to be on wheels, or wings, or skids, how is it possible to teach the manual arts without teaching the expressions of locomotion?

The best expression of design adapted to locomotion are the birds and animals and plants that express their activity in their design. Imagine a bird or animal so designed that there is doubt as to which way it goes. I believe there are a few such but they are designed according to their functions and can go in either direction like a street car.

I have already mentioned that interest is transferred most definitely by sequence. The transfer of interest is given the name "rhythm" by some of our writers. It is not a good name but is perhaps the best one to express that continuity of movement evident in music and graphical things.

Have you noticed how degrees of speed are expressed by blunt and sharpened contours; abrupt and gradual changes of tone or curve? Of course, you have; and so have the students under your instruction. There is no more interesting study than the expression of dynamics. Once these interests are employed in design the teacher's problem is to develop a discriminate use of them. Chains will not be used where struts are advisable.

Exposed cantilevers will not be designed in the form of brackets. The contour of a bracket or the line of a chair or table leg will not express weakness and uncertainty.

Even the floors will lay flat and the ceiling will not fall because they will be designed in pattern rigid enough to inspire our confidence.

The walls will have suitable texture and color to serve as backgrounds for people and furniture. The whole as well as each separate unit of design will be in harmony. This is no small problem and yet we will not have satisfied those who conceive that we should develop creative imagination.

For my part I have resolved to teach design as a logical best way of doing things, taking great care to give as much information and suggestion as I can but to give as little arbitrary injunction as possible.

Realizing that I shall never be able to find rules and recipes for the best effects in all circumstances I shall continue to observe, enjoy and even attempt to create pleasurable impressions, and to pass them on to others.

Having done this, I shall not grieve with a music teacher who confessed that after twenty years of teachiny he could count on the fingers of one hand those who had gone from his instruction capable of professional performance in art.

I should be satisfied with the assurance that all of my pupils had developed taste, judgment and enjoyment of good design.

Designed and Made by Students in the Milwaukee State Normal School.

Britannia Metal— VI

Professor William H. Varnum, University of Wisconsin.

"Also, that no one of said craft, great or small, shall be so daring as to receive any workman of the craft * * * if he be not a good workman and one who can have the testimony of his masters."—From Ordinances of the Pewterers, A. D. 1348.

THE training of the pewter craftsman was a long and arduous one: six years of apprenticeship! An additional year was demanded in which the accepted craftsman was supposed to reimburse his master for expenses accrued during his probationary period. Furthermore and as a sort of thesis, he was required to make certain ware under exacting conditions which varied from time to time.

Among the bits of drudgery of his apprentice days, *turnwheeling* must have reached the climax, inasmuch as he acted as a human motor, turning a large wheel belted to the pewterer's lathe, a simple enough affair with its head and tail-stock and a mandrel for the ware. Simple as was its construction, the lathe played an important part in perfecting the designs of the period.

As has been explained, mould making, casting, and turning entered into so much of the old ware that one cannot well omit them from serious consideration. Moulds were formed from a large range of materials: gun-metal appearing most common, followed by sand, lithographic stone, plaster-of-paris and even wood. These moulds were prepared for casting by a coating of white of an egg mixed with red ochre, finely powdered pumice stone and other mixtures tending to check striation or furrows in the metal.

Whenever possible, the ware, such as spoons and forks, was cast in one piece while the larger articles were cast in sections and thus built up by soldering. A tankard for example, would be cast in three parts; one for the base, a second for the barrel, while the third mould formed the handle. Frequently a hollow handle was cast in halves and then soldered together. In exquisite finish, these moulds were comparable with the dies of the present day.

Designs for Casting and Turning-Supports

Our design sheet, Plate 1, is planned to stress casting and turning. In the study of this sheet, one decides at a glance that the cast portions of each problem, (bases and handles) are marked by distinct delicacy of line and fineness of proportion; characteristics directly to be attributed to the possibilities inherent in casting and in lathe technic. Contrasting with his delicacy one notes the robust curves of the main masses of the designs, barrels, bowls and the like, all products of the beating-down, bending, or raising processes. These two points of comparison illustrate perfectly the strong influence on design exercised by tools and tool processes.

In the bases shown in Plate 1, delicacy of line is effected by means of contours derived from architectural mouldings, perfectly fitted to Britannia or pewter design wherein sculpturesque ornament is inappropriate to the material. In the lower part of the plate, architectural curves used by the Greeks in Ionic and Corinthian columnar design are depicted. Compare these with bases selected from American Colonial cups and tankards—one may readily recognize the design knowledge displayed by these craftsmen-designers who understood their classic motives and used the Greek curves with impeccable taste in the order in which they occurred in the originals. The cymas, beads, fillets, cavettos, and so on, are all there, arranged in rhythmic order. The same spirit is manifested throughout the examples chosen, Greek curves modified by other races and peoples.

Aesthetically, these mouldings give bands of light and shade, varying in widths and intensities of light and dark, supplying superb transitions from the base or supporting member to the body.

Handles

Both bases and handles are classed as appendages and must be bound in harmonious relationship to the main mass. The sauce boat with its free and swinging curves demands a similar handle as does the candy dish. The Eighteenth Century pewter mug of English design with its robust curves has a fittingly synchronized handle, while the delicate mouldings of the base give balance by variety. The late Eighteenth Century English mug, simpler still in line, demands and has uniform handle design.

Appendage Design Rules

The appendage should be designed in unity with, and proportionately related to, the vertical or horizontal character of the main mass to which it is attached.

The appendage should have the appearance of flowing smoothly, and if possible tangentially, from the primary mass or contrasting with this arrangement, leave at a near right angle.

The appendage should, if possible, echo or repeat some lines similar in character and direction to those of the main mass.

The Problem and Its Construction

The question of casting and turning will be divided into two parts; (1) involving casting and finishing, (2) casting and turning to be described in the following article. As a constructive problem I have chosen the handle of the late Eighteenth Century English mug of Plate 1, and for its mould, plaster-of-paris. From the perspective of the middle ages craftsman, plaster failed to possess the essence of durability; material from which hundreds of castings might be produced. For school uses it is admirable, in that

duplication tends to cheapen and destroy art. Plaster moulds will live their limited span of existence and then depart to be replaced by new, and it is to be trusted better ones.

with the barrel, and a slight amount, according to one's skill, for the final finishing. With a thin and slightly warm knife, cut out the pattern. In order that the model and casting may withdraw smoothly from its

Plate II.

One's first step is to design a mug similar in spirit to the illustrated pattern, governed by the design rules herein suggested. Purchasing one-half pound of modeling wax, immerse it in warm water to give plasticity, model into a flat sheet slightly thicker than the handle and trace the designed handle on it. Allow $\frac{1}{16}$ of an inch for filing and fitting at junction points

mould, give a slight taper from surface A (Plate 2, Figure 1) to surface B, carrying this taper or draft along all edges. If one so desires, the model may be cut from a plaster *bat* or sheet, from wood or from lead, but wax is simpler in that it needs no preparation to keep the plaster from adhering.

Figure 2 shows the model placed on a sheet of glass with the tapering edges upward, boxed in by strips of thin tin or cardboard held in place, and with the joints securely sealed by clay or plasticine. The latter is excellent in that it does not dry out and may be used repeatedly. Indeed, some prefer to use this mould and to cut the strips of tin one inch higher than the pattern top.

Pouring the Mould

Superfine plaster-of-paris, secured from any paint store, is sifted slowly into a bowl of water until the plaster begins to appear above the surface of the water

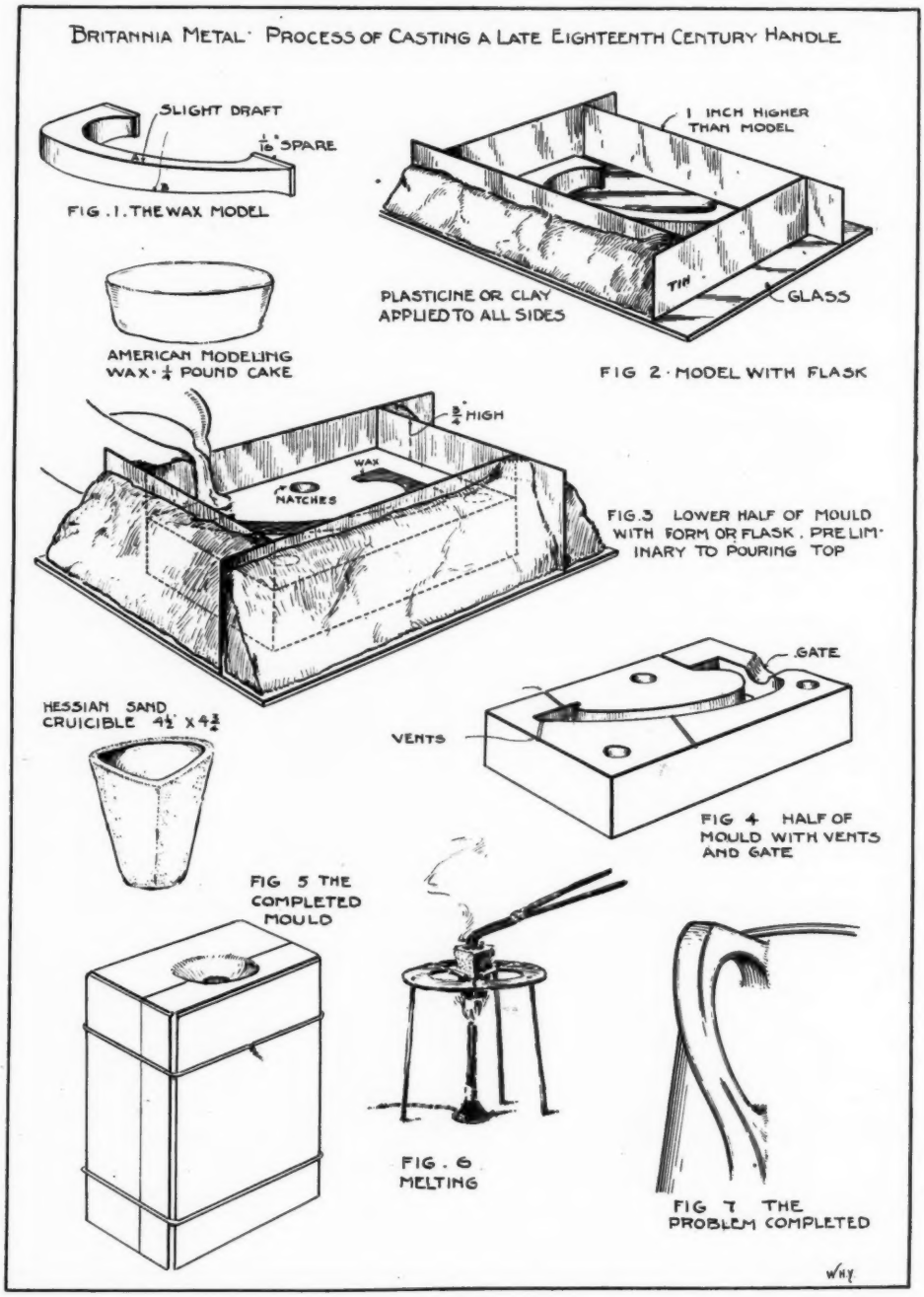

BRITANNIA METAL · PROCESS OF CASTING A LATE EIGHTEENTH CENTURY HANDLE
SLIGHT DRAFT
1/16" SPARE
FIG. 1. THE WAX MODEL
1 INCH HIGHER THAN MODEL
PLASTICINE OR CLAY APPLIED TO ALL SIDES
TIN
GLASS
FIG 2 · MODEL WITH FLASK
AMERICAN MODELING WAX · 1/4 POUND CAKE
3/4" HIGH
WAX
MATCHES
FIG. 3 LOWER HALF OF MOULD WITH FORM OR FLASK. PRELIMINARY TO POURING TOP
GATE
VENTS
FIG 4 HALF OF MOULD WITH VENTS AND GATE
HESSIAN SAND
CRUICIBLE 4½ X 4¾
FIG 5 THE COMPLETED MOULD
FIG. 6 MELTING
FIG 7 THE PROBLEM COMPLETED
WHY

Plate I.

material for model construction, but in my judgment it is a bit too plastic for handle modeling. It is imperative to leave at least one inch of clearance between the extreme points of the model and the walls of the at all points: a state of saturation. With the hand or a wooden mixing ladle stir the plaster to a creamy consistency, keeping the hands or ladle immersed at all times. This counteracts the tendency to introduce air

bubbles produced by a vigorous beating of the mixture. Without losing time, pour the plaster slowly into the mould until it is filled. Give the table a few sharp jars with one's hand; this will detach any air bubbles from the pattern and work them upward toward the surface.

In a short time, usually fifteen or twenty minutes, when the plaster feels warm and has set, remove the strips of tin and slide the mould gently from the glass. If the model has been well constructed and placed firmly on the glass, no plaster will be found on the *down* side of the mould.

Remove any loose edges, fill in air bubbles with wet plaster and cut the natches or juggles; hollow hemispheres made by revolving a dime in the still wet plaster. These joggles will be duplicated in relief in the mould top, supplying a guide for replacing that member.

Parting Mixture

A preliminary preparation of the completed half mould is termed *doping*; necessary as a preventative to keep the top from adhering. Dope or parting mixture is made by boiling one pound of soft soap, one-quarter of a pound of Russian tallow, and a small lump of soda; or dissolving one pound of soft soap in one quart of water and stirring in one-quarter of a pint of parrafin oil. (Cox). Several coats should be given until the mould feels waxy and is surface saturated. Dry the mould and rub with cotton waste, making a smooth, glossy surface. A final light coat of olive oil completes the process.

Figure 3 shows the doped mould with the wax model in position and ready for the pouring of the cover which for small projects should be at least ¾" thick. After pouring wait for the plaster to set and with a thin knife blade, separate the moulds, working from all sides gradually along the joint.

Remove the wax model and note the manner of its withdrawal. If small bits of the mould are pulled away, the draft or taper is faulty, or there are undercut surfaces. With a knife correct these inaccuracies. Cut the pour hole or gate and with a pin point draw lines across the mould for air vents, as in Figure 5. Take this opportunity to dry the moulds thoroughly: they are dangerous if cast wet. Dust with powdered charcoal or fine pumice before casting.

Casting

Hessian sand crucibles are excellent for melting Britannia and may be purchased from any jewelry or dental supply house. A good melting device is sketched in Figure 6 consisting of a bunsen burner, a ring stand had a clay triangle with the crucible handled by small crucible tongs.

Fill the crucible with scrap Britannia, raise to the melting point and pour into the assembled and dried mould (Figure 5), which may be supported on a bed of cinders or coke. Pour steadily, as an interrupted stream may damage the casting. When cool, lift the casting carefully by the gate and metal in the air vents.

Finishing

File into shape, using old pieces of leather belting for facing the jaws of the vise. The point between barrel and handle should be filed with a half-round single-cut file while the rounding edges are secured by the combined effects of both half-round and flat files. Polish thoroughly with fine emery cloth followed by tripoli and the felt buff so that the handle gives a pleasant tactile reaction when gripped. Wire into position on the barrel as directed in Article 3, solder, remove the surplus material or solder and supply the desired bright or dull finish.

While the mould about to be described is not as simple for beginners in the art of casting, it has certain advantages connected with the freeing of the metal after casting. Support the handle, (Figure 2) by inserting small stiff wire props in the model, raising it one inch above the glass plate. Pour the plaster until it is just half-way on the pattern; when set, remove the handle gently and trim the mould to an even surface, reinsert handle, dope and repeat the steps of Figure 3. Now we find one-half of the handle in each half of the mould. Remove the props, close the holes with wet plaster and continue casting. In using this mould, the handle draft necessarily is from the center line of the handle outward toward the edges, permitting the casting and model to be withdrawn from each half of the mould.

NOTE—As some misunderstanding has arisen regarding the size of solder, stipulate $\frac{1}{8}$" diameter in ordering solder wire.

The Job Sheet an Aid in Teaching Home Mechanics

F. E. Tustison, Stout Institute, Menomonie, Wis.

In the article on Home Mechanics in the December issue, we tried to take care of two problems in the establishing of a Home Mechanics course. These problems were, first, how to take care of the shop in the way of equipment; second, what is there to teach? A third problem now presents itself, namely, how to teach the numerous jobs indicated.

A few questions explain the typical situation that arises. Shall we have a faucet for each pupil in the class? How shall we take care of sharpening the lawn mower? These questions have in mind the old idea that every pupil must be doing the same thing at the same time. Because of the nature of the subject as to variety of things done and to equipment necessary, this is almost impossible. The solution seems to be that different jobs must be carried on at the same time.

It is not our aim at this time to go into detail describing what seems to be the best method of presen-

tation. What we wish to emphasize, however, is the use of the job sheet as one aid at least in the conducting of the general shop classes. The following is a sample job sheet used in an eighteen weeks' course in practice teaching at The Stout Institute. With the aid of job sheets of this type, many different activities were carried on at the same time with a minimum amount of interruption. Such an instrument appears to solve the carrying on of such varied work as will be found in the Home Mechanics shop. It is our intention from time to time, to give in these columns other job sheets illustrating different kinds of work done.

Job Sheet
Home Mechanics (Electrical)
The Stout Institute
F. E. Tustison

JOB SPECIFICATIONS:

To install a feed through switch in the attachment cord of an electrical appliance of the home.

The feed through switch is a handy device for controlling the electric current in the electrical appliances of the home. It is installed in the attachment cord of a toaster, percolator, waffle iron, etc., and by the mere pressing of a button the current is turned on or off. The object is to so place the switch that it rests on the table within easy reach of the operator. This method of control is much more simple than the pulling off and pushing on of the ordinary attachment piece.

THE SWITCH IN USE.

MATERIAL:

Attachment cord, feed through switch, and thread.

TOOLS:

Screw driver and knife.

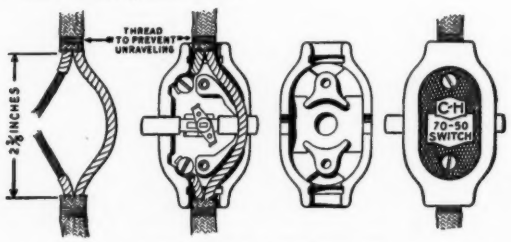


DIAGRAM FOR CONNECTIONS.

PROCEDURE:

(1) Determine position of switch.

For appliances at the table it should be mounted from 12 to 24 inches from the utensil so that it rests near the plate of the user. For the school exercise it is placed as near to the attachment piece as possible. This is done to save attachment cord.

In connecting to an electric iron, if the cord is connected to a socket overhead, the switch should be mounted 24 to 36 inches from the socket, which allows it to hang within easy reach but does not permit it to drag or rub across the ironing board.

(2) Prepare wire.

When the proper place has been selected, wind two pieces of strong thread around the connector cord about 2⅜ inches apart. This prevents the outer braid from fraying after being cut. Next remove the outer coating of the wire between the two pieces of thread, being careful not to remove any of the insulation on the individual wires. Then cut one of the wires midway between the two thread windings and cut insulation off the two free ends about ¾ of an inch. Grasp the fine wires between the thumb and the forefinger and twist them together in a uniform strand.

Do not cut out a piece of wire. The two severed ends of wire are not too long to be attached to the binding posts.

If the wires have an asbestos covering, remove it from the one which has not been cut, leaving only the rubber insulation. This will facilitate assembly.

(3) Make connections.

Take the feed through switch apart by removing the two assembly screws.

Make connections to the two terminals, winding the wire under the set screws in the direction in which the hands of a clock rotate and tighten screws. **Have your work checked at this point by the instructor.**

Fasten two halves of the switch together, placing the uncut wire in the groove of the switch cover and it is ready for use.

(4) Operation.

Push light button and current is on.

Push dark button and current is off.

In connecting device to a lamp socket, the socket should be in the on position and the feed through switch in the off position. When current is desired, it is then merely necessary to press the light button on the switch.

(5) Test.

Attach the cord to an electric iron or similar appliance and try the switch.

QUESTIONS:

1. If, in testing, a fuse was blown, what evidently happened somewhere in the circuit?
2. Why twist the fine wires together?
3. What is the objection to cutting off some of the fine wires when peeling insulation?
4. What is the capacity of the switch?
5. What happens if you use switch on larger than rated capacity?
6. What is the difference between lamp and heater cord?
7. How can you remember what button to use?

RECORD:

Name..... Class.....

Date begun..... Date finished.....

Can you answer all of the questions?.....

Instructor's Grade.....

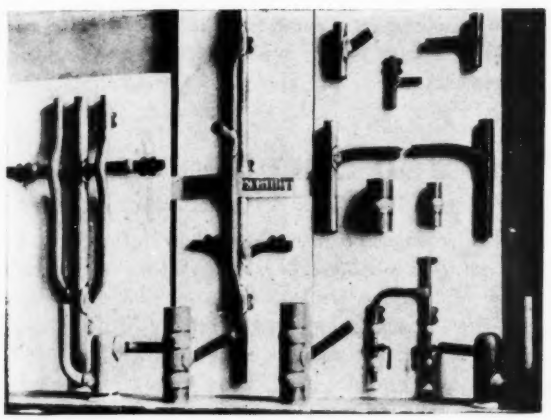


Exhibit of Plumbing Work by Students of the Ramon Baldiotry de Castro Technical School, San Juan, Porto Rico. Harry E. Jarrett, Instructor; Herman Hjorth, Director of School.

Tennis Racket Stringing

Louis J. Haas, Director Therapeutic Occupations, Bloomingdale Hospital, White Plains, N. Y.

DOUBTLESS tennis players will say that only a professional can restring a racket, but the work is not such an unfathomable mystery. True, there is no literature on the subject, except a leaflet which comes with a box of awls and pliers made by a firm which furnishes gut tennis strings.

With a kit of tools which consists of from six to eight awls of different lengths and sizes, a pair of gut pliers and a small flat hook, five or six 1½″ pieces of copper joint tubing, or the same number of needles like those which used to be furnished with bachelor buttons, one is equipped for the work. Three other things are needed: a tennis racket needing repairs or restringing, a supply of gut (both nineteen foot and twenty-one foot lengths, and a small quantity of colored trimming gut), a racket stringing clamp, which can be bought or made, and enough patience and curiosity to find out how the racket has been strung.

Rackets may have one or two strings repaired without the aid of a racket clamp or vise but no other attempt to string a racket should ever be made without the support of some kind of a clamp. The clamp on the market costs money, and may hinder the worker starting the experiment, but home-made substitutes can be constructed at practically no cost for wood. While these are not as convenient to use as the iron clamp, they do support the racket so that the lengthwise tension will not split the throat of the racket before this strain can be counteracted by the cross strands. Once the racket is placed in the clamp and work started, this support must not be released until the stringing is completed.

A very simple form of clamp or support, which any one can quickly make for an initial experiment, is a board of hard oak or maple 1¼″ thick, and cut 1¼″ larger than the shape of an average racket. Across the handle end of the board, is fastened with screws a cleat of wood 1½″x2″x3″. The clamp is held firmly in a vise by the aid of this cleat. A wide groove is chiseled in the handle part of this board to clear the handle of the racket, allowing the head to lie flat on the clamp. Eight 2¼″, No. 12 round-head screws are driven into the board at such places as will equally support the racket against the different spreading tensions. Washers are placed under the head of each screw and hold the racket head down to the clamp or support board. The drawing, Fig. 1, explains all the details.

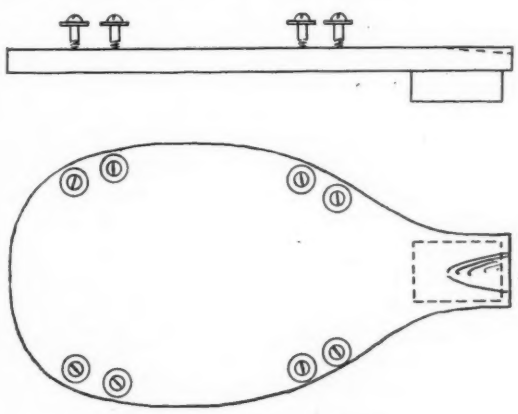


Fig. 1. A Simple Form of Clamp.

A more convenient form of clamp is made by carefully gluing cross grained, two one inch boards of oak, ash or maple. The outside contour is then cut to a line 1½″ larger than the largest racket. An opening is cut through the clamp on a line representing the inside of the head of the racket, these edges being slightly rounded. At the eight points of contact, another ¼″ or ⅜″ of wood may be allowed over the outside contour line. Slots are cut at the points of contact to allow adjustment. Thumb nuts and bolts with right angled pressure blocks, supply the points of supporting contact with the racket. A small brass sleeve fits over each bolt, protecting the gut from possible injury by contact with the threads. The drawing, Fig. 2, explains all the structural details of this type of supporting clamp, which besides being easily adjusted to any style of racket, also allows free use of the hands, both above and below the racket while the stringing proceeds. It will be noticed that this clamp is also hollow to receive the handle of the racket. A cleat on the under side of the clamp furnishes a firm grip for the vise jaws.

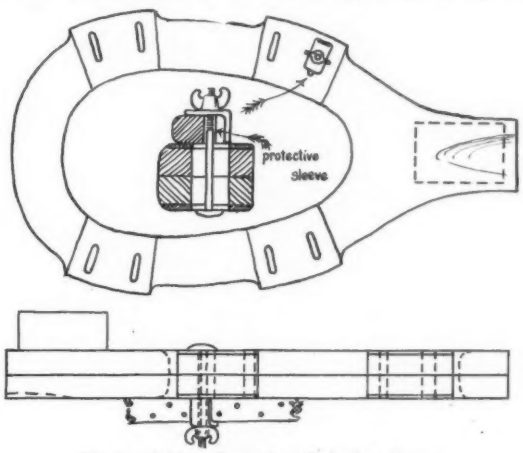


Fig. 2. A More Convenient Stringing Clamp.

There are many styles of rackets, and the procedure in stringing the racket must suit the style. Also, there is much individuality exercised by the workman in drilling rackets of the same style, so that it cannot be said that a particular make and style of racket is strung thus or thus. Therefore, the worker should carefully examine the restringing job before removing any of the old gut. Here are the points to observe: Is it a single strung racket, or has the center been reinforced? If reinforced, which holes contain the double strands? These might be marked on the rim and throat with a pencil. Where and how has the stringing been started?

Which way do the ends of the twenty-one foot strand travel, and where do they end? Where does the short or crosswise strand end, and which pair of holes represents its middle? These points may also be marked in pencil on the rim. It is well also to measure the strands when removed, to see that the length of strand to be replaced is sufficient. This will also guide in proportioning off the right amount of the short or crosswise strand on either side of the starting points.

So having placed the racket in the clamp and having removed all of the old gut after noting the manner in which the racket was strung, proceed thus: Take a twenty-one foot length of gut, carefully cut the binding, and uncoil. Place one end of the strand in a vise attached to the work bench and with the other end in the gut pliers walk away, placing tension on the strand. Take care that the coil is carefully unwound lest it form kinks when the tension is placed upon it. A kink allowed to form and pulled tight will mar the gut. Pull hard for a minute on the strand to take the slack out, and it is ready to use.

In some rackets the gut passes, first through the handle from side to side, and then up through the next hole on either side, coming out through the two holes at the center of the throat. It then goes to the two center holes in the head of the oval (see Fig. 3). In other rackets, which often when restrung look identical with the first, the gut starts from the center of the head and enters the two holes at center of throat, coming out on opposite sides of the handle. (See Fig. 4.) The difference is in the drilling. The examination of the racket before old strings are removed will decide which of these starting points is to be used. There are variations on these two principal differences, but they are not standard and need not be explained as an examination of the racket discloses them.

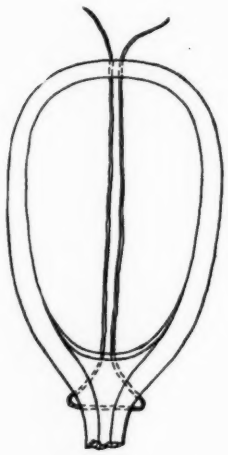


Fig. 3.

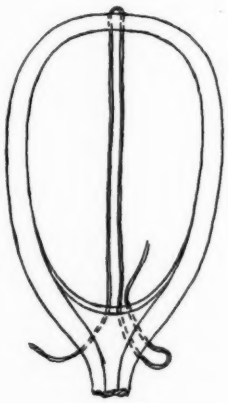


Fig. 4.

The stringing of a plain racket which is drilled to start at the head proceeds thus: The two ends of the twenty-one foot length of gut, having been brought through the rim at the head of the racket, take an awl and push it into one of these holes until the gut is held firm. Take care not to split the gut with the awl. Now pass the strands down through the two center holes in the throat of the racket, and out. These strands just laid must be pulled taut. Wrap the gut three or four times about a smooth six inch piece of broom-stick or one inch dowel and using this friction grip pull the gut taut, inserting an awl carefully into the hole to hold the tension as explained by Fig. 5. Do this on the other side of the handle of racket and then proceed. Pass the ends in and up through the next hole on either side, unless the racket calls for the use of another hole, and then out through the proper hole in head of racket.

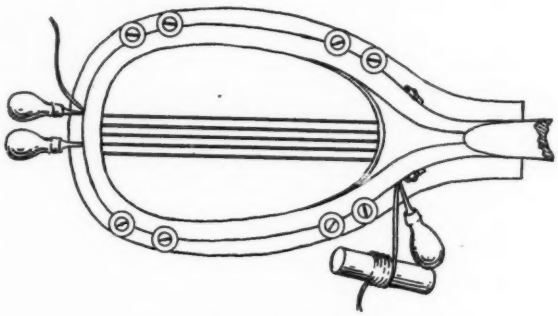


Fig. 5. Placing the Long Strands.

Before pulling taut, place the piece of brass or copper tubing or bachelor-button needle under the loop of gut on the outside of the rim on either side of the handle, pulling taut as just described. The tube or needle should be smooth and have no sharp edge. It is left in place one being placed under the first three loops formed on either side of the rim at the throat or handle end of racket as shown in Fig. 5.

The stringing of the long strands proceeds thus until all the strands have been laid. Each strand is pulled taut and held with an awl and then the awl in the hole preceding it may be removed. As the stringing goes on it will be found necessary to skip every other hole at the end near the throat of the racket to keep the strands parallel. The stringing should advance regularly on both sides of the center to keep the tension balanced.

Experience will teach the amount of tension to place on each string. These should be taut enough to sing when struck with the fingers. When all the long strands are laid the gut will end toward the throat of the racket. Take an awl and carefully lift each loop and in turn slip the ends of the gut beneath it, pulling taut. When the first tube is reached, slip the gut through it and pull gut and tube through and out from under the loop. Pull taut and proceed to the next tube. See Fig. 5; it will explain how this is done. When the gut end has been substituted for the last tube or needle, and pulled taut, the awl which has been holding the tension may be removed. The stringing of the long strands is now complete.

The needles or tubes are used as a means of getting the gut ends under the first three loops on either

side of the handle, because the loops are too small to be raised with the awl without damage. The long strands having been laid and secured as described, work begins with the nineteen foot length. The gut is treated to remove the slack, apportioned, and the two ends are inserted through the two holes marked on the rim. These should be the two center ones by count, care being taken to see that the gut is started on the proper

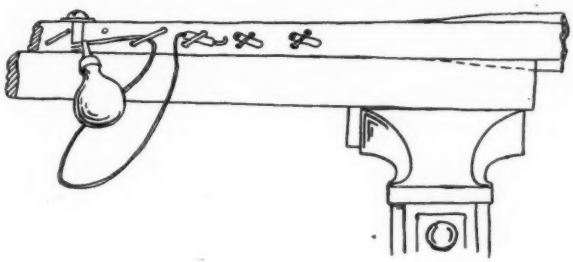


Fig. 6. Securing the Ends of the Long Strand.

side of the head or oval so that it will be traveling in the proper direction. If it is not, when the head of the oval is reached the gut will not fit into the channels cut for it into the outer surface of the rim. This will leave the gut unprotected on the only part of the rim's surface where it is subjected to wear.

Should the racket have been unstrung prior to being received, it is best for the novice to test with a string for the direction and proper placing of the gut. This may be done very hurriedly to prove that the worker's course of procedure is correct. The gut is secured with the awl at the start and then carefully woven over

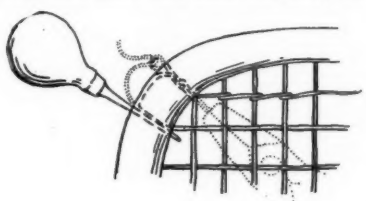


Fig. 7. Splicing with the Trim to Secure Cross Strands and Trimming the Racket.

and under one all the way across the long strands of the racket, passing through the same two holes in the rim on the opposite side of the racket head. Each end in turn is pulled taut with the friction grip and secured with an awl. The same care against injury of the gut must be taken as previously described. The two ends of the strand of gut travel away from each other, one completing the upper half of the racket head and the other the lower. As each strand is woven into the fabric and comes out through the rim, it must be pulled taut with the friction grip and held with an awl. In the weaving, one hand is held below the racket and the other above. The hook is only used to get the gut up between strands that are difficult to reach. When the last strand has been laid at the top and the bottom of the racket oval, pull taut and secure with an awl.

Cut a piece of trimming gut sufficient in length to go across the number of strands required at the top of head of racket, allowing six inches for working. Pass one end through the next hole in the rim to the secured gut end, and pull in all but three inches of the trim; pass this end in so as to form a loop of the trim on the outside of the rim. Now put the end of the racket gut through this loop, leaving just enough slack between it and the awl to allow the trim loop, when pulled, to carry a loop of the heavier gut half way through the thickness of the rim. Take the trim and go across the racket making a single wrap about each long strand and in the case of reinforced centers, about each pair of strands. When the rim is reached, pass out through

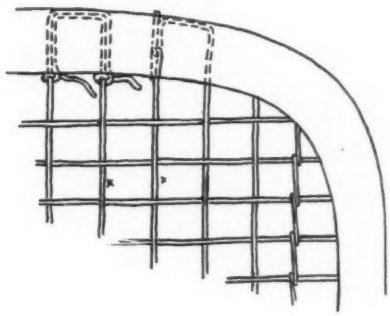


Fig. 8. Method Used to Replace Broken Strands.

the proper hole and then in and across the racket again. When the proper number of trimming strands are laid, pass in through the next hole and make a hitch about the heavy gut passing through this hole. The same procedure is followed at the throat of the racket, and the work is complete. The above is illustrated in Fig. 7. The two securing awls may now be removed, ends of surplus carefully cut off and if desired, a preservative applied to the gut.[1]

Where one or more strands are to be replaced, the best course to pursue is as follows: Carefully pull up taut one end of the broken strand and secure it with an awl. Insert the ends of the new strand in the next hole, making a loop with it and securing the end of the broken strand in the same manner described for securing the gut with the trim. Now proceed to weave the new strand in place, pulling taut each strand as

[1]This may be considered unnecessary, but if it is desired can be procured from a dealer in rackets.

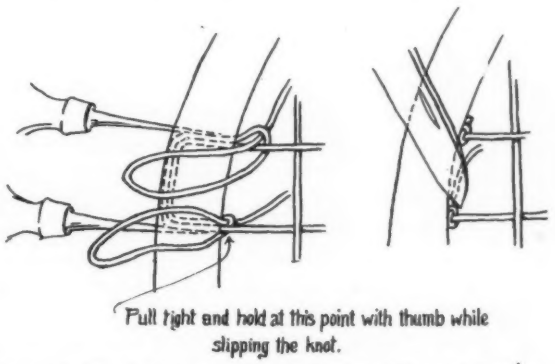


Fig. 9. Securing Old and New Strand Ends with Tight Knots Trimmed Close.

laid, securing with an awl when the last strand is laid, and tie as follows: Take the surplus of the new strand in through the same hole as the end of the old. It is secured by an awl in the preceding hole so it may be pulled taut enough with the hands. Now pull the old strand up taut and secure both in this hole with an awl. The first awl is now removed, and the old strand is inserted and tied about the new strand on the inside of the rim. The new strand is tied securely to the old strand and the job is complete. The awl may be removed and the surplus trimmed away. Figs. 8 and 9 show clearly how these knots are made.

After the novice has repaired and restrung his first racket as described above, if he will compare it with a new racket, he can decide whether his job compares favorably with the other. He can make such corrections in tension, etc., as are indicated by this comparison when he undertakes his next job.

The Real Purpose of Printing as a Shop Subject

C. W. Hague, Menomonie, Wis.

WITH printing rapidly finding its place in the public and vocational school-shop curriculum there is a possibility of its true purpose, or aim, being distorted to justify its right for existence. In many instances this diverted aim has been carried to the extent that the department has ceased to function as a course of instruction, and exists only for the material returns which it produces. This is the sick stage of the department and it will soon die a natural death unless it is again brought back to an instructional basis.

The possibilities of printing as an industrial arts course are generally recognized as superb, both for their current value as a manual and cultural subject, and for the underlying value as an aid in practically all other fields of business and industry. In no other subject is there a greater opportunity to develop the skill and accuracy of the learner. In no other shop course is there the correlation of academic subjects that are involved in a well organized course in printing.

The value of printing as a school subject lies, not so much in the development of the student to perform numerous operations which produce jobs, as in the cultural and educational attainment which it affords. No printer can be justly acclaimed an illiterate. Likewise no illiterate can ever make a good printer. In order to produce effective work as a compositor the student must possess a good knowledge of grammar, spelling, punctuation, syllabication, etc. Every printer must have a practical knowledge of mathematics, especially as applied to the printer's system of measure, and be able to apply the fundamentals of art and design. Other academic subjects, such as, the history of printing, applied science, and sanitation and hygiene may be incorporated into a course of printing instruction and their applied value is very educational. All related subjects should be *adjacent* to practical trade operations; they should be taught directly in connection with the shopwork, and preferably by the shop instructor. In printing, as in no other shop course, instructional material may be used in the form of shop projects, and it is advisable to take advantage of this opportunity so far as possible.

The true purpose of printing, whether in the public or vocational school, is to develop the individual, and unless this is the predominating aim the course will be a failure. Objections to this may arise from trade schools were the student is preparing for practical production work in the shop but unless the individual has been trained to use more than his hands he will be of little use to the printing industry. Too often the apprentice in the shop is regarded as a flunky, whose duty is to do routine work and to provide a cheap means of unskilled labor. This is unfair to the boy, and indeed unprofitable for the employer. Unless the individual is trained and developed as rapidly as possible there is a direct waste of latent productive ability which is *uneconomical* and the boy will soon become discouraged.

In many instances the determining factors for installing a printing department in schools have been of a selfish nature. The superintendent or director conceives the idea that by putting in a little equipment, and engaging an instructor with a little practical experience, he will be able to obtain much useful printing for the school. He convinces the school board that with a comparatively small expenditure, and an additional teacher, he will be able to save a large printing bill each month and be able to better organize his work as the result of more adequate printed forms. He may even go so far as to assert that the department will be self-sustaining after a short time but this will soon be proven an impossibility if accurate accounts are kept in which overhead expenses are included. It is true that much useful production work can be done by a school printing department but where this is an aim, both the instructor and pupils will suffer, unless the selection of the work fits into a definitely organized outline of instruction. Where the printing department is burdened with excessive production work the students must either be placed upon jobs of which they are incapable and which results in poor work and low standards, or the instructor must do the work himself at such times as are needed for preparation and recreation. Practical work, without a doubt, is the most desirable form of project provided that the selection fits the needs of the

THE SCHOOL PRESS

An Advertisement of the American Type Founders Company in the form of a School Paper, for the purpose of informing Superintendents of Schools, Directors of Industrial Art Subjects and Principals regarding the Educational and Vocational values of Printing as a subject in the schools

VOL. I | JERSEY CITY, N. J., FEBRUARY, 1924 | NO. 1

Printing an Ideal Subject for the Junior High School

UNDOUBTEDLY one of the most valuable and successful innovations in modern education has been the creation of the junior high school. It has aroused increased interest in education on the part of the children by motivating the work during the most critical and important period of education—the transition period between the elementary and the high schools.

Printing Department, Binford Junior High School, Richmond, Virginia

Motivation of the academic work of the school has been accomplished by introducing industrial subjects into the curriculum. These subjects, aside from the motivation value, serve the purpose of bridging the gap between the elementary school, with its grade organization, and the high school, with its departmentalized organization.

Perhaps the most popular of these special subjects is Printing. This subject, though industrial in character, has a natural affiliation with the academic subjects, and the child who is permitted to have printing instruction does not feel so completely divorced from his previous methods of receiving instruction in the rudiments of education; namely, spelling, English, arithmetic and art. On the theoretical side of printing he still comes in contact with spelling, reading, punctuation, paragraphing, capitalizing and careful arrangement; on the practical side he is taught manipulative skill in one of the most important industries of the country. Whether his future lies along cultural or vocational lines he has been benefited by instruction in Printing.

As proof that the above statements are justified by actual results let us take the opinions of Mr. Ernest Shawen, Principal of the Binford Junior High School and two of his pupils who are receiving instruction in Printing. Mr. Shawen's letter is of peculiar interest to educators who are planning to equip junior high schools. The letter follows:

"Printing has been taught in this school for five years. There has been an increase in the number of pupils taking the subject each year. At present there are twice as many boys taking the subject as selected it the year it was introduced. The type of instruction given is prevocational, the object being to give the learner an appreciation of the printing art and a practical insight into the elements of the industry.

"I feel that printing is of considerable value in this school from an educational standpoint. It impresses upon the minds of the students the necessity for good form in composition, for correct spelling, and for the proper use of capitals and punctuation marks. It also correlates very nicely with the work in the art department and arithmetic. Our printing classes play an important part in some of our special school enterprises. They print the tickets, programs and window cards for our entertainments. They print our school paper and our school handbook, all of which contribute materially to the school's success."

The two pupils who wrote regarding their opinions of printing did so voluntarily. After all, it is such opinions that are most convincing. Here are their letters:

"I am deeply interested in printing because I feel that it has helped me greatly to see the importance of arithmetic, spelling, punctuation and good English.

"I have been working in a commercial print shop after school and on Saturdays for the past month and what I have been taught in this school print shop has helped me in many ways.

"I expect to make printing my trade and I recommend this subject to the boys of Binford School."

(Signed) FRANKLIN STRINGER—1A

"I have been taking printing in Binford School for some time, and I find that it is not only a splendid subject from an educational standpoint, but it is very, very interesting."

(Signed) ROBERT HALL—1A

Printing as a subjec in

Some of its EDUCATIONAL POSSIBILI S A

By WILLIAM B. KAMPRATH, *Jr. of Elm*

WE ARE familiar with the old saying, "the printing office is the poor man's university," and some one has reminded us that "one cannot be a compositor for a quarter of a century without insensibly acquiring an education and a store of knowledge far excelling the ordinary."

Schools maintaining courses in printing are finding that the subject has many features commending it for educational purposes. The printing press can readily be made a factor in education because of a very natural relationship between it and almost all subjects of the school curriculum.

There is no other line of activity that is so peculiarly rich in its associations as printing. It "underlies all learning." Its influence will function in all branches of academic training: language, reading, spelling, drawing, arithmetic, history, geography, science, etc. Shop activities in a printing school soon invade and transform these departments, and vivify and vitalize them by substituting bookishness with reality. The shop becomes the dynamic force from which emanate the invigorating currents that give life to every subject in the curriculum. It also becomes the magnetic pole that attracts all subjects unto itself, and holds them in unified relation to one another and to itself.

Successful work in a printing course depends upon the mastery of certain academic subjects, and from the very outset pupils recognize the need of these studies. They may never before have thought them worth while; but they see their utility, and they begin to fathom the old adage, "Knowledge is power," soon after they take up the study of printing.

THEY discover that the subject necessitates abov THE a all things a thorough and intimate knowledg as th of language. In the setting of bold, cold type ther reservat is no way of disguising ignorance. Every impro and is, punctuation mark, every misplaced capital, ever ess card, misspelled word, every poorly constructed sentenc r, the is a "Daniel come to judgment" when once in prin nount iss Nothing can impress boys so strongly with th ony; th necessity of care in English expression as such page On fi of cold type, bearing compositions which are th articular work of their own heads and hands; and our exper d math ence has been that pupils can develop wonderf is foun powers of expression in their composition work, th hat its they can write more coherently, more accurately tudy of and in every way better than many pupils of greate raining o talent, who pursue the regular grammar school course matics.

Bacon wrote, "Reading maketh a full man. nvolved Printing unconsciously maketh a reader. The ver ractical nature of the work will develop in boys a greate ith prin skill in reading as well as a love for books. Book Many appeal to printer-boys; they are the creations d press printers. They are the realities of their own efforts ook or What workman is not appealed to by the creation ense, th of his own hands? ind th

The practical usefulness of the printer's typ nd Fran case as a means of liberal training is most fully rea its of hi ized in a consideration of the influence it bears on th rinting, teaching of spelling. With this movable alphabet ou he Baby youthful printers learn the association of letters i he Roma words in a manner productive of positive result on, Fran The brain centers of sight and touch working in con any; the junction as they do in typesetting make possible ver istory. effective spelling instruction. losely to

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THE art element in printing is as ever-present as the language element. Printing is the "Art preservative of all arts." No matter what the work in hand is, be it the composition of letterhead or business card, an advertisement or a page of straight matter, the principles of drawing are always a paramount issue. Order, unity, balance, proportion, harmony; these are always of prime consideration.

On first thought, it may seem that there is no particular relationship between the subject in question and mathematics. On closer investigation, however, it is found that typography is an exact science and that its very foundation stone is mathematics. A study of the American Point System is in itself a training of no mean proportions in elementary mathematics. But aside from the mathematical thinking involved in typography, there are infinite kinds of practical work in arithmetic that may be correlated with printing.

Many think of a "Printer" as an ink-smudged pressman or a compositor who sticks type for a book or a daily newspaper; but, used in its broad sense, the term "Printer" means much and brings to mind the names of men like Gutenberg, Caxton and Franklin. The craft presents many interesting bits of history. The Chinese and their wood-block printing, the Egyptians and their carvings on stone, the Babylonians and their cuneiform brick libraries, the Romans, the Medieval Monks, Gutenberg, Caxton, Franklin, Greeley, the Curtis Publishing Company; these represent, the whole gamut of the world's history. Here is an opportunity to relate a subject closely to the experiences of the boys.

EVEN science may be brought under the vitalizing influence of the shop. It need no longer be studied with spool and string pulleys and yardstick levers, but it can center itself around the mechanical parts of the various presses, stitchers, cutters, motors and belts comprizing the printing equipment.

In a school print shop, a co-operative spirit is ever prevalent. The work is socializing in its influence. The selfish spirit of a manual training shop where each boy makes his own necktie racks and skis is supplanted by the goodwill-to-all spirit of the print shop where each boy who sets a good job and puts it to press finds enjoyment in distribution of the fruits of his labors to his fellow classmates and friends.

Thus the story goes. When we consider the wonderful possibilities of printing as a subject for school work; when we apprehend the interesting and vital correlations with other departments and activities of school life that can be discovered and developed; when we behold the extended panorama of cultural subjects glorified by their associations with the art which "underlies all learning;" and when we remember that schoolmen from time immemorial have been cudgeling their brains for new school arts which might interest and profit children; then we wonder that this "tool of instruction" did not long ago force itself upon the minds of educators and win for itself a place in our halls of learning.

Note: Mr. Kamprath has supervised instruction in printing in the Elm Vocational School for over ten years. His opinion concerning the educational value of printing may be considered authoritative.

...f the A... Type Founders Company employs the services of ...ined s... aid you in establishing printing courses in your schools. ...the ...vice" is spelled H-E-L-P.

...er ...UCATION DEPARTMENT

...unders Company

...AVE, JERSEY CITY, N. J.

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PRINTING

Is Adapted to All Types of Schools

FROM the fourth grade to the university's course in journalism, in schools covering the country, have printing outfits been installed. Statistics show that both initial cost and maintenance are lower than for most industrial subjects.

WHAT SOME EDUCATORS THINK OF PRINTING

As a Manual Training Course

We have carried it on this year with some groups of our eighth grade boys as a manual training feature. The results have been very satisfactory.

Very truly yours,
DANIEL HOWARD, *Supt. of Schools*
Windsor, Connecticut

As a Senior High School Course

We propose instituting cooperative educational courses in the high school next year and boys who wish to learn the printing trade will be placed in the commercial and newspaper printing shops about the city.

As to the educational value of a printing course, in my judgment the arguments are all in favor of such courses. Training in printing will place the highest emphasis upon all the practical phases of an English course. For that reason alone I think it should be included in every modern high school curriculum.

Very truly yours,
E. M. BALSBAUGH, *Superintendent*
Public Schools, Lebanon, Pa.

As a Junior High School Course

I should like to see printing offered in every junior high school in the country. I believe thoroughly in printing from the educational standpoint. I do not care a whoop about its vocational value inasmuch as we are not making printers in the school. But from my experience I do know that it teaches a boy law and order, it teaches him that an error made repeats itself many times, he sees the why of punctuation, it teaches him that there is such a thing as good English, etc.

Yours very truly,
L. B. MCMULLEN, *President*
Northern Arizona Normal School

As a Vocational Course

Our print shop makes it possible for us to issue a monthly school publication, through which we may keep our taxpayers acquainted with what their money is doing for the boys of our community.

Of course the value of printing as a trade cannot be ignored, and we find the print shops in our vicinity more than anxious to employ boys who have had the advantage of vocational school training.

The problem of operating a successful vocational school is greatly simplified by the addition of a print shop.

Very truly yours,
C. E. PARSIL, *Director*
Middlesex County Vocational Schools
New Brunswick, N. J.

Costs of School Printing Equipments

SCHOOL Printing Equipment Costs are governed by the size and type of school, character of course it is proposed to furnish and number of students to be accommodated, as well as by the various styles and sizes of presses and other printing material. Equipments recommended by the American Type Founders Company are designed to fit the particular needs of your school. Write today, giving the information suggested and sending us a rough sketch of the room in which it is proposed to install the printing equipment. Show size of room, location of doors and windows and electrical outlets. In return you will receive a suggested list of equipment designed to meet your particular needs, and its approximate cost, together with suggested courses of study. Address your letter to the

EDUCATION DEPARTMENT

American Type Founders Company

300 COMMUNIPAW AVENUE, JERSEY CITY, N. J.

student and forms a definite part of instruction. At the best it should be only a by-product of the main objective, instruction.

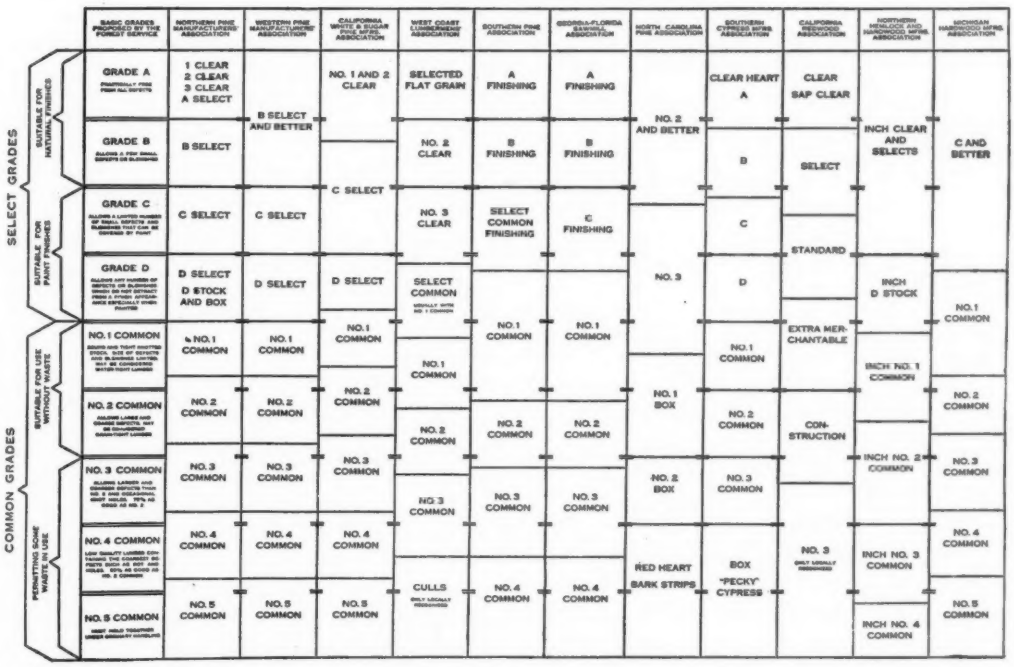
In many cities where printing has been introduced in the school there has been a decided reaction on the part of the local printers. This is particularly true in the case of vocational schools where trade work is taught and the boys may find employment in the local shops. Naturally the employer is eager to have an able instructor and the kind of instruction which will best fit the boy for his particular needs. It is well to have the close cooperation of the local employers and to meet their demands, provided they are broad enough in nature to insure the student a worth while future. Even here the chief aim should be to develop the student, and in so doing he will be of greater value to the employer, and his opportunity for self-attainment will be greater. As a rule the reaction on vocational schools is very favorable.

The reaction on the part of the printers where printing is placed in the public school may not be so favorable, partly because many of them do not understand the real purpose for its existence, and partly because they fear that they will have a new competitor which will relieve them of part of their business. If such is the case an attempt should be made to give the craftsmen a correct understanding of the motives, and to assure them that the school will do none but its own printing. This fear of competition is rightfully grounded for many schools have through "charity work" and otherwise supplied much printing to outside organizations and individuals. This is usually the result of a request from some friend of the faculty or school board and is intended as a personal favor where funds are lacking. Nevertheless the local printers have contempt for this policy and it should not be employed. The public school can usually offer a varied enough selection of printing forms and ample work to meet the needs of the students, and it should be limited to this. The commercializing of products is another means of stretching the purpose of the subject and will develop disapproval for the work.

In conclusion it may be said that printing is rapidly developing in both public and vocational schools as an educational and manual subject. The increase of printing departments in the past few years is highly gratifying and more than *certifies* its popularity. Like every other departure from the academic curriculum, it is undergoing close scrutiny and criticism but like every other worth-while movement, it is here to stay and grow if only we do not lose sight of the real purpose of its existence.

COMPARISON OF YARD LUMBER GRADES OF THE PRINCIPAL SOFTWOOD MANUFACTURERS' ASSOCIATIONS AND BASIC GRADES PROPOSED BY THE FOREST SERVICE

BASED ON DEFECTS PERMITTED IN EACH GRADE AS SHOWN IN PUBLISHED GRADING RULES



The accompanying chart shows a comparison of the yard lumber grades of the principal softwood manufacturers' associations and the basic grades proposed by the United States Forest Service. Each column in the chart represents the range in lumber quality from the best to the poorest found in commercial use. The grade divisions into which the Forest Service basic grading rules separate the material cut by the different associations are indicated in each column by the double line projections of the basic grades shown in the left-hand column. The comparative positions of the grade rectangles indicate the differences in the quality of material admissible in the grades when the official grading rules of the associations are followed. In one or two cases a line between grades has been raised or lowered a little when actual grading practices have been found to differ from an association's published grading rules.

The chart may be used as a guide in purchasing lumber. Anyone wishing to change from a species of wood with which he is familiar to some other wood can tell the grade of material he should order. Thus, a user of C Select white pine changing to Douglas fir would select a grade of No. 3 Clear. It must be remembered, however, that the grades are compared in the chart only by the defects permitted, and that no allowance is made for the inherent qualities of the woods themselves or their suitability for certain purposes. The quality of the clear wood may be great enough in some cases to offset to some extent the effect of the defects present.

INDUSTRIAL-ARTS MAGAZINE

E. J. LAKE S. J. VAUGHN
Editors

EDITORIAL

1924

The new year brings new problems and new opportunities. In ways, of course, the new year is tied to the old year and to all the past, yet in a very real sense it opens a new set of books for both debits and credits. To a considerable degree, the worker in any field may write his own entries in the new ledger.

Of course, the pessimist and alarmist will clamor, and the man who never wants to give full measure of his time and skill for value received will complain. Of course, men will still want lots of money and little work; lots of privileges and no responsibilities; lots of snaps and no drudgery. But it still is so that this is a pretty comfortable old world and this the very best of all its countries.

All that is needed is a spirit of fairness—of give-and-take, a little more brotherly love, and a firm resolution *to learn how to work again.*

THE NEED FOR TEXTBOOKS

The need is growing for more and better textbooks in the field of industrial arts and vocational education. For a long time, the tendency in this field was to undervalue the importance of textbooks. This was a natural reaction aainst the formal and slavish use of textbooks so long adhered to in general education.

In the early days of practical education when all forms of it were known as "manual training", a few men did a conspicuous service by formulating in textbooks the principles and practices of the work according to the accepted practices of the day. These books served their purposes but now the whole body of theory and practice has changed. Such texts are no longer usable. Considerable confusion exists. Teachers are a little less sure of the place, significance, and procedure of their work. They are seeking help and guidance in the bigger aspects of their work rather than the mere manipulative tasks.

There is need for teachers of broad vision, adequate training, and successful experience to think through the whole scheme of industrial arts and vocational education, and to formulate in well arranged texts general lines of procedure for the various phases of the work.

Good books are almost daily coming from the press which deal with specific shop procedure or mechanical manipulation. They meet a very important need, and as shop methods and procedure change and improve, and as new teachers constantly join the profession, the demand will grow for up-to-date textbooks of this character.

It is not enough, however, that texts be supplied that deal with mechanical routine and shop practice. Perhaps the great need is for texts that can be put into the hands of prospective teachers in the colleges, universities, normal schools, and other teacher-training institutions. Such texts must be comprehensive, clear-cut treatises on the history, development, purpose, scope, underlying principles, and approved methods of the entire field of industrial arts and vocational education. Not one volume, but a series, would be necessary to cover the field adequately.

Here is a task that calls for the best talent in the country, and it is a task worthy of the highest ambition and the most painstaking effort.

THE CARE AND EDUCATION OF THE VETERANS

Whatever the outcome of the investigation of the Veterans' Bureau, we sincerely trust that interest will not lag in the problem of the care, hospitalization, and vocational education and advisement of our sick and wounded service men.

It was serious enough that at first the Federal Board had to grope its way under the most trying circumstances and against disheartening obstacles. But if incompetency, insincerity, and grafting should be found in the later administration of this work, it is a most lamentable matter. It would lead us to wonder whether it would not have been infinitely better if real educators had remained at the helm and the real spirit of education, which is the spirit of altruism and service, had remained the dominating ideal and influence. It is to be hoped that those who are now in charge of this important work will leave no avenue obstructed which leads toward the prompt and efficient performance of this prime duty of our government to the men who lost their health and their vocational power in its defense.

If guilt is finally established against any person or persons whereby sick and wounded veterans have been neglected, mistreated, or defrauded, then the voice of common decency cries out for speedy and adequate punishment.

SCHOOL ADMINISTRATION AND THE APPROACH TO VOCATIONAL EDUCATION

The transition of a factory function to a school function has been more noted during the past year than it has at any previous period since the introduction of vocational training. Certain stages at least have become more pronounced.

While there has been a consciousness in industrial circles that with the advent of the machine and the era of mass production the apprentice system was waning, there was no pronounced demand upon the schools to recruit the army of skilled workers. The evolution in the industrial field was slow in demonstrating that with the passing of the older worker there grew a corresponding demand for the new. The machine did not eliminate entirely the judgment of mind and the skill of the hand. The touch of the trained is still in demand.

Tne newer phase in the transition from shop to school is found in the attitude of the industrialist in turning more squarely to the schools for aid in recruiting his forces.

Vocational education has traveled along its own route, consulting the industrial compass, and, in general terms, reaching the goal. The industrialist has awakened to an emergency and become specific as to goal and time of arrival.

The building industries have felt most keenly the shortage of skilled mechanics and have come to the realization that the vocational schools of the land, which are as yet young in their establishment and not entirely perfect in their operations, must come to the rescue. The vocational schools, on the other hand, have met the situation with remarkable readiness and reasonable completeness.

The thought that popular education, as exemplified in this country, has widened its function by accepting vocational studies as a fixed part of its labors, must be accepted. The community that possesses vision and enterprise, realizing that commerce is predicated upon industry, knows that its future rests more largely upon its productive rather than its trading ability.

Thus, what a fraction of the public has hitherto been inclined to stamp as a mere schoolmaster's vagary, has become something valuable. The youth that is trained to fashion the things that go into the economies of life finds a demand for his services. More than that, he strengthens the ranks of useful citizenship in that he contributes a worthy share to the world's work.

But, the transition is not complete. The industrial factors will in future turn with greater confidence to the educational forces for recruiting service, and the schools on the other hand will meet the demands with greater completeness. The era of cooperation between the educational and industrial forces is at hand.

THE BUSINESS MAN'S VIEW OF A SCHOOL SYSTEM

There is a growing disposition on the part of commerce bodies to manifest a concern in the cause of education, and to make closer inquiry in the matter of cost and results. This concern is augmented not only because of the higher taxation rates, but also because good citizenship demands an active interest in the schools.

A recent issue of School Life, the official organ of the United States bureau of education, says:

"Business men of this country may be trusted to place their money where it 'pays,' directly or indirectly. They learned long ago that broadened knowledge increases men's wants and makes them better customers, and therefore that education is good for business and a good investment on general principles. But it is only recently that organizations of business men have reached the conclusion that it is good for them to employ educational experts and investigate educational matters on their own account."

The studies made by the United States Chamber of Commerce and the Chicago Association of Commerce have not been so much for the purpose of finding flaws as they have been to demonstrate a cooperative attitude and to express the judgment of American business on certain tendencies in the field of education.

And here it may be frankly stated that the business man has not in some of the larger issues been in accord with the educator. Nor can it be expected that he should. But, there is no question that these differences after all have their value. The schoolmaster who trains the youth should have the reaction of the man who employs the youth. And if the man who contributes liberally to the tax budget should become more discriminating as to the expenditure of his dollar he merely exerts his rights of citizenship.

The tendency of a widened interest on the part of business men in the cause of education is perhaps better expressed in the more frequent appearance of the schoolmaster before local chambers of commerce, Rotary, Kiwanis and Lion Clubs in discussions of educational projects and departures.

In making this statement let it be added that there never was a period when a jointure of business and education was more timely than now. The commercial and industrial interests are making larger demands than ever upon the schools which in itself should prompt a more extended concern in what the schools are doing.

But, underneath all are found the economic considerations which must be borne in mind. Business recognizes the value of education and is willing to pay the price. But, business must be informed as to the school output, more specially when larger monetary considerations are involved.

There are some conspicuous examples of school bond failures in American cities where business or education, or both, have failed in striving for that mutuality which makes for desired progress. Where business fails in taking the initiative, education must do so. The educator must bring his business partner, the taxpaying public, into his confidence. School bond issues are not carried unless this is done.

The experience of the past year has taught that where the commercial and civic bodies of the community are in accord with the school authorities, the demands of the latter are readily granted.

America must have good industrial art or go to the wall, good schools or go under. We have a good conceit of ourselves. There are good pupils, but there is no good training ground—we must put up or shut up in art. Despite our museums, our art clubs, our prizes, our scholarships, our millionaires on the outlook for ads out of art, we must have technically trained artists and craftsmen instead of half-cut amateurs. —Joseph Pennell.

Building and Using a Hydraulic Dynamometer

A Problem for Pattern, Machine and Automobile Shops. Ray F. Kuns, Principal, Automotive Trades School, Cincinnati, Ohio.

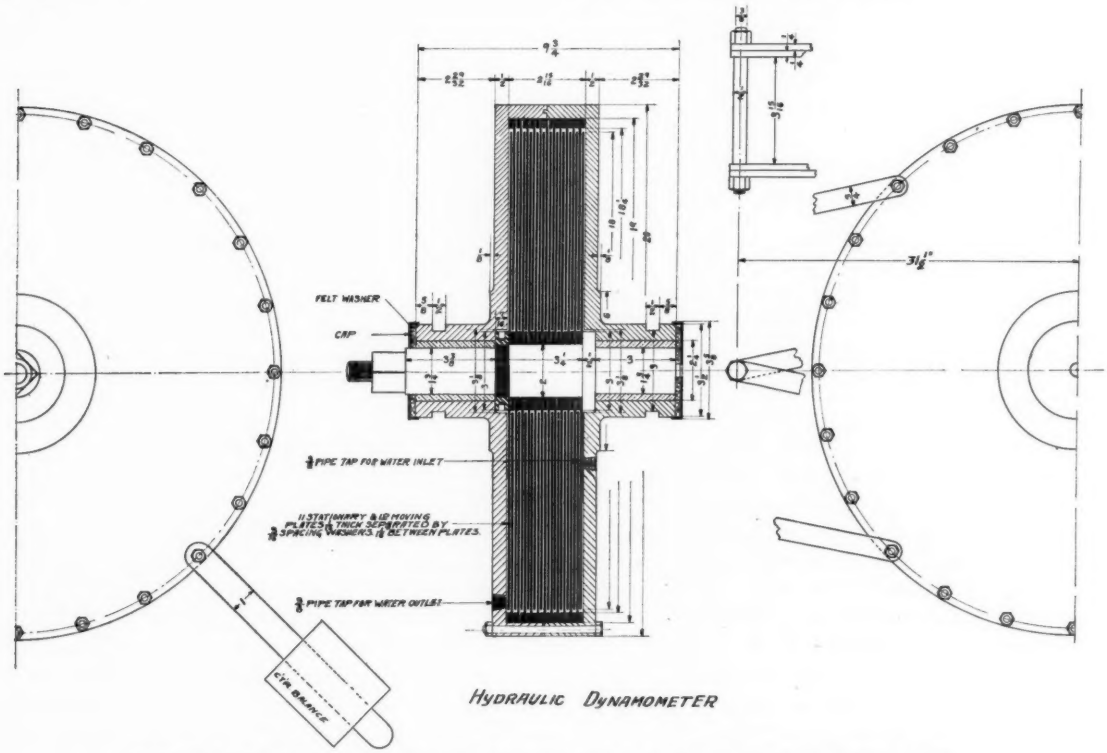
AFTER the auto mechanic has overhauled an engine, he takes it to the nearest steep hill with which he is familiar, in order to test its power, and incidentally, the worth of his work. If he has tested a number of cars on the hill, he can tell a great deal about the condition of the engine by going over it once but if the trouble is a difficult one to locate, he will go over it several times until he is satisfied that he has judged the job properly. He may then return it to the shop, or just stop at the side of the road and tune and adjust until he gets what he believes to be proper response and performance. However, he never knows just what horse power the job is developing, nor just how it would perform if the fixed load were held for a considerable length of time. Results very much worth while are obtained by testing on the road but more and more the dynamometer is being used in the shops, as results are more easily cataloged and adjustments more readily made.

For a number of years the Cincinnati Automotive Trades School was without means of testing the power output of engines which were maintained on stands as part of the school equipment. The result was that after the students had rebuilt an engine, there was nothing by which to judge the engine and workmanship except the sound of the engine as it ran idle. No load could be placed on it and as a result, false conclusions were likely to be arrived at. An instance of this was a Ford engine which had been built up by the students from standard Ford engine parts. The engine was built up piece by piece, and when completed was apparently a perfect job. When running it sounded quiet, it picked up quickly, would run at any speed, and was pronounced a perfect job. No doubt the students doing the work were given a good rating.

Several months later the dynamometer described herein was completed. After testing several other engines, the Ford was connected to it. On the first test it showed a power output of 12.8 H. P. With this result the work of the students did not seem to rate so high. The job, however, was as complete as they had had means of making it. With the load on it, it was possible to adjust and tune the engine until it developed 20.8 H. P. Eight horse power was tuned into the engine. The engine was not rebuilt again to get this result, but by adjusting the carburetor, and working on the ignition the improvement was made and definitely measured.

A certain six-cylinder engine was recently tested. At the first start it developed a pull of 30 pounds at a speed of 1800 R. P. M. The dynamometer is so designed that the H. P. output is readily figured. Torque or pounds pull times R. P. M. divided by 2000 gives the actual brake H. P. In this instance $30 \times 1800 = 54000 \div 2000 = 27$ H. P. After driving the engine and dynamometer at this speed for about one minute, the engine started to slow down and continued to slow until at the end of five minutes the speed was reduced to 1400, and the torque to 20 pounds. This gives: $20 \times 1400 = 28000 \div 2000 = 14$ H. P. Careful inspection of this engine showed that the job was so designed that the water came in at the front and was taken off at the center of the cylinder block and head. While the front three cylinders remained cool, the rear three were overheated, and the water around them boiled at a furious rate.

With a four cylinder engine which developed 24 H. P. with everything in good condition, it was found that one plug misfiring, or cut out entirely the power dropped to 16 H. P. With two cylinders cut out, the power dropped to 7.5, and with three cylinders cut out and only one hitting, the power developed was 2.75 H. P.



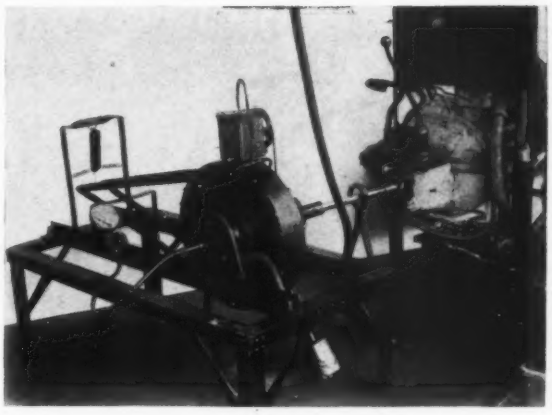
Details of a Hydraulic Dynamometer Designed, Made and Used in the Cincinnati Automotive Trades School.

Such tests as these serve to give to the students real information on what happens when certain like conditions obtain in the daily service of the cars. With the dynamometer too, it is possible to test and prove the worth of gas savers, new carburetors, ignition devices, etc. Gas consumption for power output as well as oil consumption and certain like items of interest can be profitably worked out.

The principal of the dynamometer shown is simple. Steel plates are mounted on a spindle and made to revolve in close proximity to other steel plates which are stationary. As a medium to create the necessary friction between these plates, water is introduced at one point and drawn off at another. This also serves as a means of cooling the machine. This particular dynamometer will measure up to 50 H. P. One thing which it will not do is show the torque of the engine at speeds much below 1000 R. P. M. This prevents the plotting of an accurate power curve at low speeds but its practicability largely offsets this disadvantage. The fact that there are no parts wearing out and needing replacing, and that it may be operated indefinitely without any overheating makes it well suited to school shop needs. It is not likely that youth in day schools will be able to use the highly specialized dynamometers to much better advantage than they will one of this type. The element of safety, too, is worth consideration, and outside of the propellor shaft used for connecting the engine and dynamometer, there are no moving parts exposed.

This particular machine was designed by Mr. William Schatz, instructor in machine and garage shop practice. and the author. The drawings were turned out by Mr. Fred Schaeperklaus, of the drawing department of the Cincinnati Automotive Trades School.

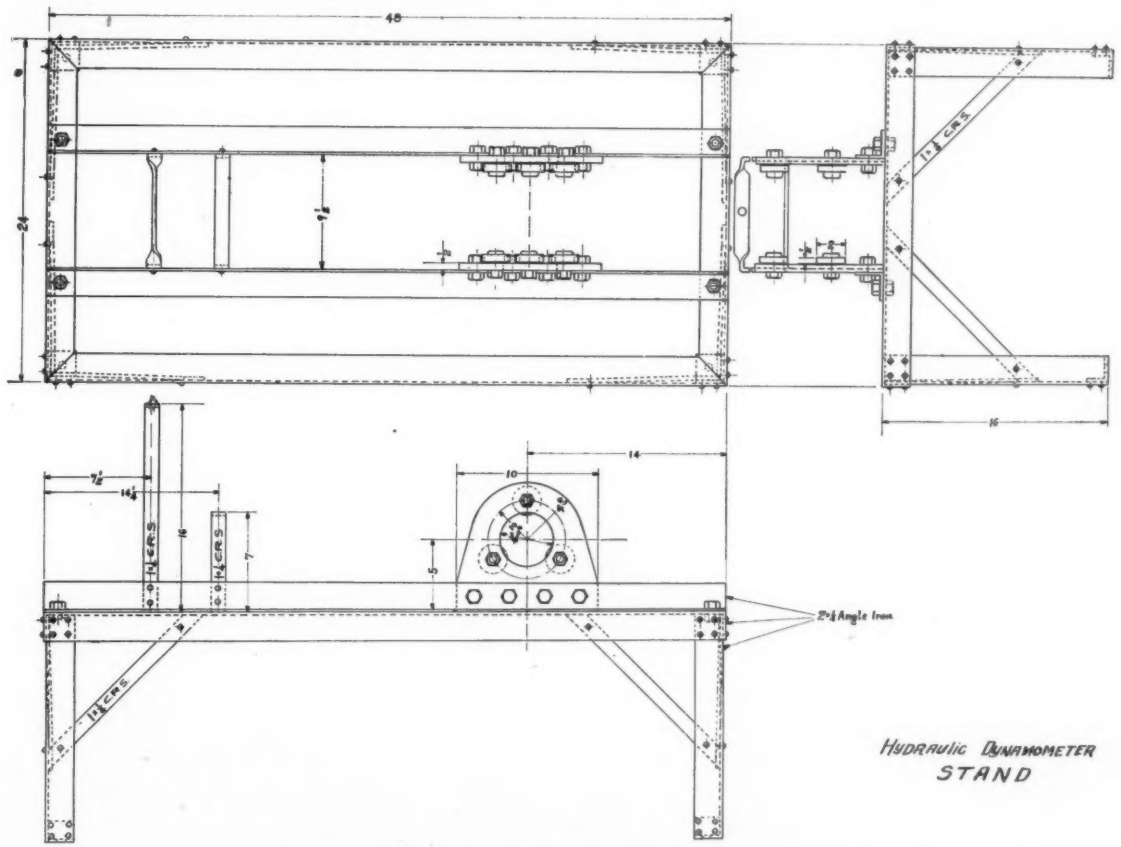
Some experimentation with a number of plates was necessary. If the plates could have been of a larger diameter, the results might have been better. The largest lathe available was an 18-inch, and this determined the size of the case.



The Dynamometer in Use.

It is not the intention of the writer to give minute directions for the construction of the machine, but for the benefit of those wishing to have a live job to serve a real need, the drawings with the following explanation will serve well.

Only one pattern is necessary for the case, since the halves are identical. In turning the halves, however, it will be necessary to mate them. The bearings in the case halves are brass tubing pressed into the case, and then aligned by boring. The two halves of the case are held together by means of 5/16" bolts.



Details of the Stand for the Dynamometer.

The shaft is a piece of machinery steel, and is provided with a collar against which to mount the plates. Plates are secured to the shaft, and prevented from turning by means of the 3/16" spacing washers and the lock nut or mandrel collar shown in the cross section. To insure additional security, a key was inserted in the shaft and notches cut in the plates and spacing washers. This is not indicated in the drawing.

One end of the shaft is provided with a square to take the end of a Ford universal. A nut holds this in place. The other end has a tachometer attached to it. This will need a little consideration by the builder to insure the instrument, and drive at hand, being made to fit. A cap and felt washer are fitted over the shaft at each end to prevent water leaking through the bearings.

The stationary plates are mounted on four bolts which are set at a proper distance from the edge of the case. Spacing washers are fitted over each bolt between the plates to keep them aligned.

Holes are drilled in both stationary and moving plates to facilitate the flow of water from one side to the other.

The stand is framed up from angle iron, and the mounting is so designed as to bring the center of the dynamometer shaft the same height from the floor as the center of the engine crank shaft or transmission shaft as the case may be. This then permits of the use of a short propellor or drive shaft, between the two machines. Ford universal joints have been standardized on for use on all machines and engines with the result that the dynamometer may be swung from one engine to another with little trouble.

The mounting of the dynamometer is so designed that there is a minimum amount of unmeasured energy. Grooves are machined in the case halves at the center bearing and rollers are fitted into these grooves so that the entire machine is nicely balanced on them. The torque arm is 31½" from the center of the dynamometer shaft to the point of contact on the spring scale hook. A safety bracket prevents the torque arm being thrown more than a few inches off center. This appears in the photo. A lead weight is provided to counterbalance the weight of the torque arm.

A bracket is provided to support the spring balance or scale. The machine is designed to have the torque arm thrown down as the load comes onto it. The tachometer (speed indicator) appears in the photo. It must be attached according to its particular design and fittings. A tachometer can be made from a good used speedometer by changing the dial, and actually counting with the hand counter the R. P. M. at the hundreds and then marking the position of the hand on the dial.

Lubrication may be provided by means of grease cups or the oil droppers. In this case, an old engine pump was mounted on the case and belted to the dynamometer shaft. It pumps oil to each bearing, and thus offsets the tendency of water to enter the journals.

In use this machine may be connected direct to the engine crank shaft by means of the propellor shaft and universals, or to the engine through the transmission as is the case of the Maxwell engine shown in the picture. Since the friction is created on the introduction of water, while the plates are turning, the connection of the engine to the dynamometer direct presents no difficulties of engine starting. The use of the transmission and clutch, however, makes a nicer set up, since the engine may be put into operation and be made ready for the load before the load is applied.

Water is introduced through a piece of half inch hose. A valve controls the admission and flow. The outlet has a piece of hose connected to it, and it is advisable to have a valve or other means of controlling it so that there may be a certain amount of back pressure, thus preventing all the water being thrown out of the case by centrifugal force. The flexible hose permits of accurate measurements, since it presents no resistance to the deflection of the machine as power is developed.

When figuring horse power, note the deflection of the torque arm, and the reading of the scale in pounds. Note also the speed of the engine or dynamometer, and record this as well. With the tachometer, this is read direct. The formula then is:

$$\frac{\text{Pounds} \times \text{R. P. M.}}{2000} = \text{H. P.}$$

If it is desired to plot a power curve, this may be done by using cross sectioned paper, and noting speed and torque on it. A torque curve may also be plotted by reducing the torque to foot pounds. To do this, multiply the torque pounds as read on the scale by 2.625. For instance, if the pull on the scale is 30 lbs., the torque in foot pounds is $30 \times 2.625 = 78\frac{3}{4}$ foot pounds.

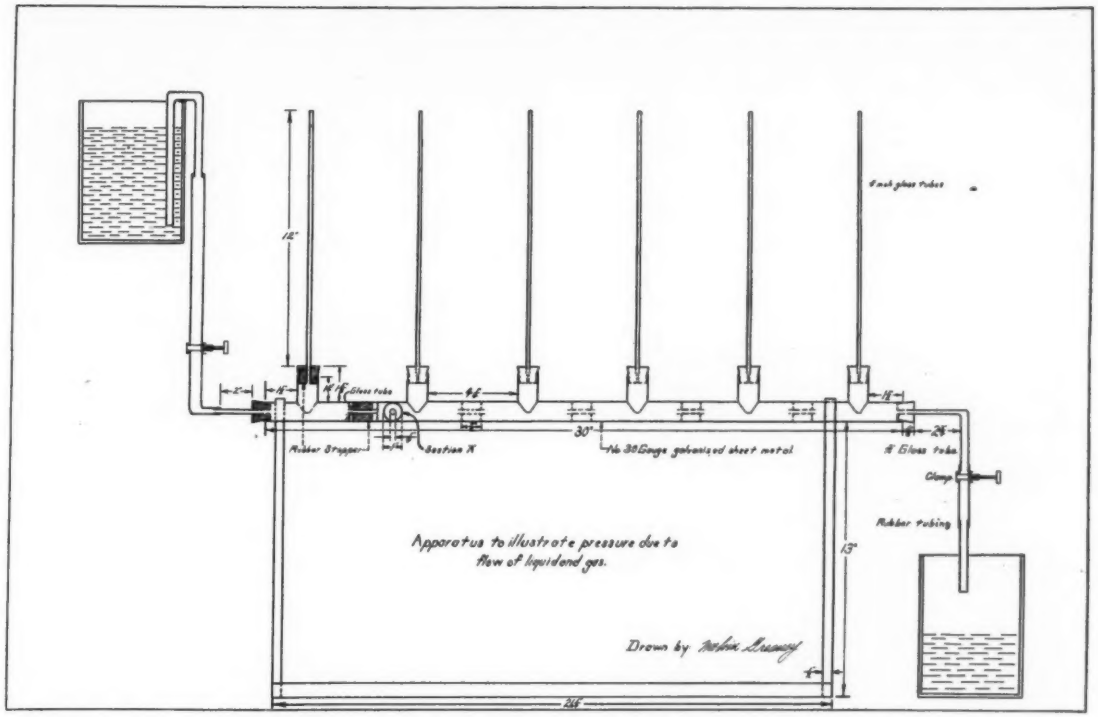
Connecting the Work of the Shop with the Work of the Classroom

Percy E. Rowell, Industrial Science Instructor, Technical High School, Oakland, Calif.

There is in industrial education a persistent demand that all of the courses, which a pupil takes, shall contribute directly to the trade or branch of industry in which he is taking his shop work. Thus we have the socalled industrial English, industrial mathematics, industrial science and industrial drawing, all with the emphasis on the industrial aspect of the study. Whether this narrow point of view is the desirable one to hold is still a moot question. It has occurred to the writer, however, that with a slight shift in the attitude of the shops, the supplemental work may become more helpful to them than is at present possible. It may seem revolutionary to suggest that, if the shops should contribute to the supplemental subjects, the industrial work would become the gainer thereby, but perhaps a little thought may convince the skeptical that such a plan would prove to be both feasible and effective. Just as a person who is continually helped rarely learns to help himself, while a person who early in life learns to help others gains in strength and is helped himself, so the shops may in contributing to the supplemental subjects gain more in the end than would have been possible if they had remained in the position of continually being helped.

The shops may contribute to the English course by constructing special book cases, card indexes, tables, and chairs. Of very great importance would be a series of models to illustrate the shop talks and the industrial English written work. These latter would accomplish a correlation of the shop and the English course in a manner which would be far more effective than is the present method. For the mathematical course many mathematical models may be constructed; drawing devices may be made for the drawing course. It is in science, however, that the shops may make their greatest gain through a spirit of helpfulness, for much of the usual science apparatus may be duplicated, and many original pieces, of special industrial application, constructed.

One example of a special piece of scientific apparatus, which was made in the sheet metal shop of the Oakland Technical High School, is illustrated. Its purpose is to show that the pressure in gases and liquids decreases according to the rate of flow. It may be used with water pressure, gas pressure, and negative pressure, that is, pressure less than atmospheric. As illustrated it is adjusted to read water pressure. It is well known, when there is no flow, the water level will be the same in all of the upright



Apparatus Built in the Technical High School, Oakland, for Testing Flow of Gases.

tubes as in the reservoir, that is, the pressure everywhere will be the same. When a small flow is permitted, the pressure falls everywhere, but the drop is slightly more near the outlet than it is near the reservoir. If the flow is great, the levels assume the positions as shown in the cut. Should it be desired to show the varying pressure of a gas, the upright tubes are removed and U-shaped manonometers of glass are inserted in their places. If the results due to the effects of negative pressure are to be shown the whole apparatus is turned over, the straight tubes dipping into small receptacles which are filled with water, and either end of the apparatus is attached to a reservoir from which the air has been partially exhausted. Atmospheric air is then permitted to enter at the other end.

This apparatus was made from raw material. A piece of No. 30 gauge galvanized iron was squared on the squaring shears to the right size, passed through the bar folder, then through the forming machine, grooved in the hand groover and finally hammered together on a piece of water pipe as a conductor stake. Since it is necessary that the tube be both air-tight and water-tight, the seam was soldered. The six holes were laid out, marked with a compass, using a radius slightly less than that of the tube, and then ground out on a small emery wheel. The branch pipes were developed flat and then made in the same manner as was the main tube. The most difficult part of the job was to line up these branch pipes and solder them in place. As a finishing touch it was found necessary to fill all of the seams on the inside of the outlets in order to give the rubber stoppers a tight bearing.

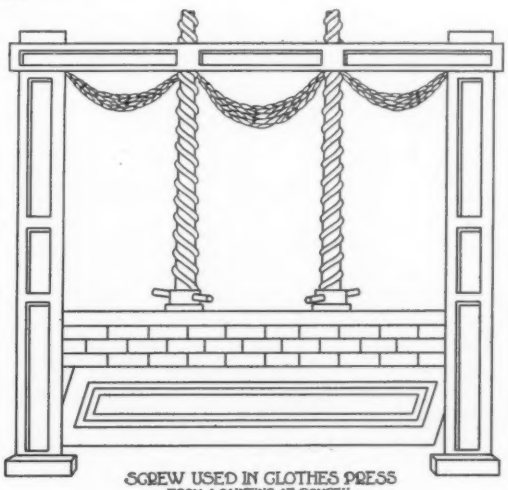
Not only was the boy who made this piece of apparatus benefitted by the work, but the whole sheet metal shop was interested in the results which were obtained. It was a practical job, with a scientific application; it was a real job, from the viewpoint of the shop, with the added goal of a useful application. In contributing to the science department there has been a distinct gain on the part of the student who did the job, and also on the part of the other students whose curiosity was naturally aroused by the peculiar shape of the tube, and because they knew that it was to be used in science.

The shop work was performed under the direction of Mr. M. Maddern, instructor in sheet metal work.

SCREW THREADS

Herbert D. Harper, Woodside, N. Y.

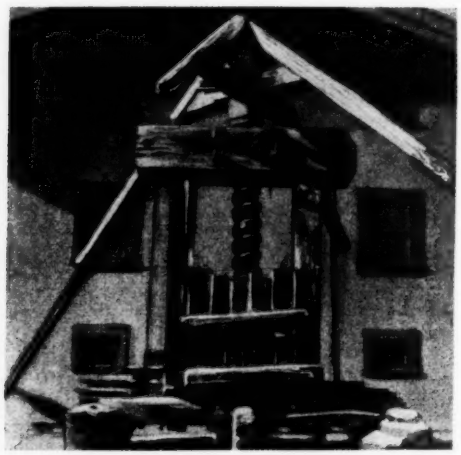
Although the screw is supposed to have been used by the Egyptians, the honor of its discovery is given to Archimedes (B. C. 250), a native of the Greek colony of Syracuse in Sicily. Two unauthentic stories regarding his first use of the screw are told, one that he used it for the purpose of launching a large vessel, while the other states that while visiting Egypt he saw the farmers lifting water for irrigation and that on his return he immediately devised a spiral hollow tube around a straight shaft, the lower end of the tube in the river and the upper end above the bank level, a handle being fitted to the shaft. As the operator turned the handle, the water was lifted from the river.



SCREW USED IN CLOTHES PRESS
FROM A PAINTING AT POMPEII

At the beginning of the first century, the nations bordering on the Mediterranean knew of its use, the Romans using it in linen and wine presses. A Greek named Pappas, who lived in Alexandria, was the first writer to describe the laying out of a screw thread. His method consisted in winding a right angle triangle of thin brass around a cylinder and tracing the screw thread from the hypotenuse. This method has been used to a large extent up to 100 years ago. By this method large metal screws were cut with chisel and file, then a nut cast around them and used for correction until the coarser errors were eliminated.

At one time it was not uncommon to see on United States plantations, cotton presses with wooden screws



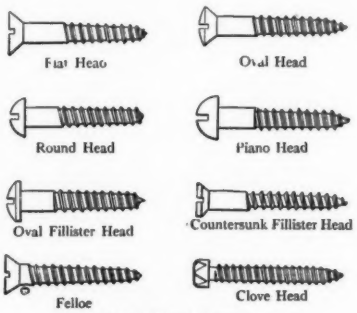
An Old American Wood Screw (Am. Machinist.)

fourteen inches in diameter and five feet long, the threads being three inches thick. These screws were cut by millwrights using ordinary hand tools.

As with other metal devices, the tedious process of hand labor was the only means of procuring screws for nearly two thousand years. The head was forged or swaged by a blacksmith, the thread and nick by the use of hand dies and hack saw.

Screws are divided into two main classes, wood screws used exclusively in wood and machine screws used in the construction of machinery. The first English patent for making wood screws by machinery was granted to Job and Wm. Wyatt who invented three machines for making screws, one for making blanks, another for nicking the heads and the third for cutting the threads. As these machines were not very successful most wood screws continued to be rudely made by hand.

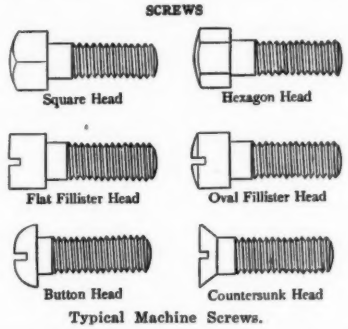
In the beginning of the nineteenth century, inventors in the United States gave considerable attention to the making of screw machines. Patents were granted to Thos. W. Harvey in 1835 and to Henry Crum and J. H. Pierson in 1836.



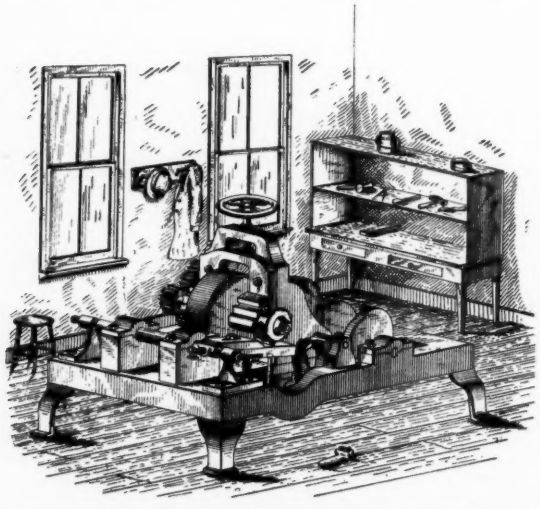
Typical Wood Screws.

The screws these machines made had a blunt point and, therefore it was necessary to bore a hole for their reception. To avoid this, Thos. J. Sloan, devised the well known pointed screw and the machinery for its manufacture. The threads of this screw, like its predecessors, were formed by cutting away the metal between them, but in recent years by a system of rolling, combined with forcible compression, the threads are raised and all the metal between them is utilized in their formation. This process is now entirely automatic.

The honor of first cutting machine threads by machine belongs to Jacques Besson of France, who devised a crude lathe in 1569. However, Jesse Ramsden,



Typical Machine Screws.



A Screw Machine, Patented in the United States in 1850 (From a Contemporary Print.)

an Englishman, in 1775 made the first modern form lathe, using the lead screw for screw thread cutting. Other English engineers, who paid great attention to the making of accurate screws, were Henry Maudslay, Sir James Barton and Sir Joseph Whitworth. The latter in 1841 devised what is known as the Whitworth thread. The form of thread most commonly used in the United States is the U. S. Standard Thread, or Franklin Institute Thread, devised by Wm. Sellers in April, 1864.

All screws made today are copies of pre-existing or master screws and these are so standardized that a thread cut in one country will fit its fellow thread cut to the same standard in another country. The threads now recognized as standard are included in about eight great systems out of 60 that have been advocated and systematized.

—**David A. Roche**, for more than 25 years principal of the Curwen Industrial School, Salem, Mass., died suddenly at his home on November 29th from an attack of heart trouble. He was one of the surviving members of the Salem Charitable Mechanics' Association and was well known for his work at the Industrial School. Mr. Roche is survived by six daughters and two sons.

PROBLEMS & PROJECTS

This department aims to present a wide variety of class and shop projects in the Industrial Arts. Successful problems are invited and will be paid for. A brief description of constructed problems, not exceeding 250 words in length, should be accompanied by a good working drawing. The originals of the problems in drawing and design should be sent.

Problems in benchwork, machine shop practice, turning, pattern-making, sewing, millinery, forging, cooking, jewelry, bookbinding, basketry, pottery, leather work, cement work, foundry work, and other lines of industrial-arts work are desired for consideration. The editors will not accept the old hackneyed problems of footstools, taborets, towel holders, etc., which have been made from time immemorial, ad nauseum.

BLACK DIAMOND EMERY WHEEL DRESSING TOOL

H. J. Wieland, Pattern & Foundry Dept., Virginia High School, Virginia, Minnesota

To the average mechanic a black diamond is something he knows little about, as these stones are rarely seen, but as we here are located in the heart of the Mesaba Iron Range, we have occasion to purchase some of these stones very reasonably. These stones are used in connection with drilling—drilling or exploring for iron ore.

The bit of a drill is about two inches in diameter on the outside and about 1¼" on the inside; six diamonds spaced equally are studded on the face. This bit is screwed on the end of a pipe. This pipe in turn is fastened on a Diamond drill chuck and revolves. While this bit is revolving it is fed into the ground. The pipe is hollow and smooth inside. The bit will cut through rock or anything it encounters on its way through the ground. As the bit is lowered and being hollow, the borings are fed through the pipe. These borings are called cores. The cores are carefully removed and broken off in lengths. These lengths are numbered as to the depth at which they were bored. The cores in turn are sent to the laboratory for analyzing to ascertain the percentage of iron they contain. The above operation is repeated at about ten foot centers, and over as many acres as the drilling contract calls for. Very often during the process of drilling the diamonds contract a flaw. When this happens they are removed and new ones set in. These flawed stones usually break into three or four pieces when removing them from the bit. Any one of such pieces will make an excellent glass cutter or emery wheel dresser. The price of new stones runs from $150. per carat up. Having acquired one of these pieces, I set about to make a wheel dresser. These stones are not set in bits as described in the drawing, but I have found this method to give a very good, solid grip.

Dressing Tool and Turned Wood Case Made by Students.

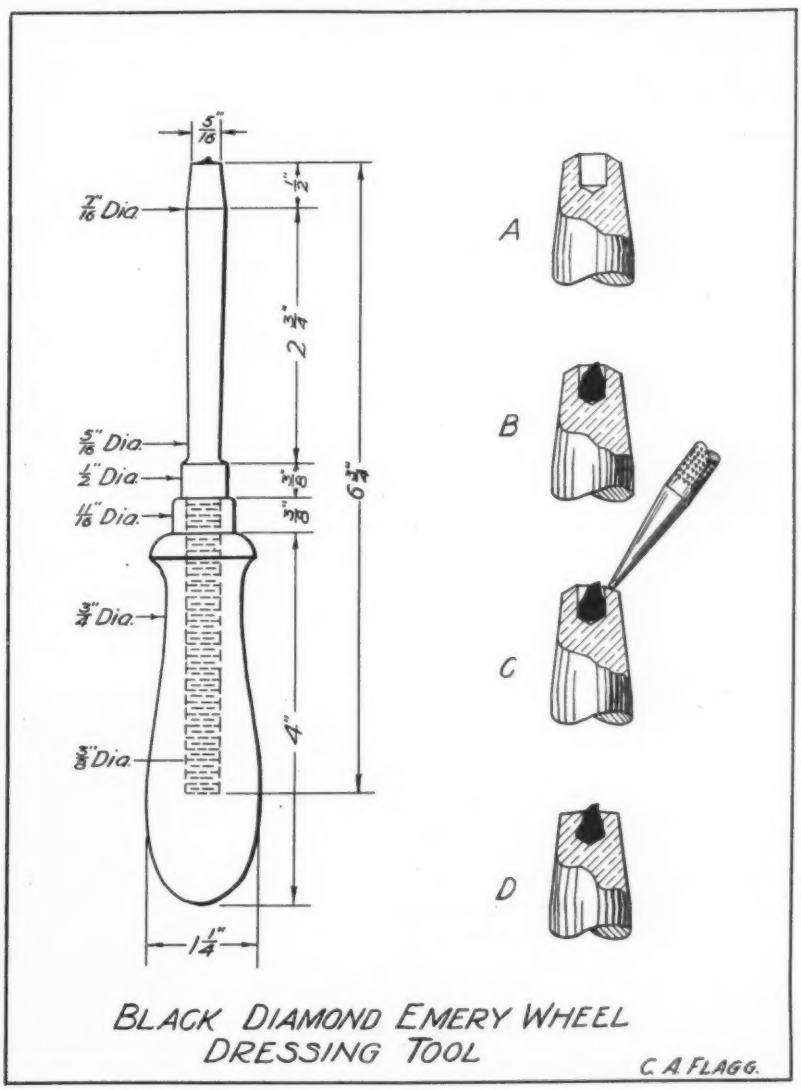
Directions for Turning

Stock—Soft red brass—½" diameter, 10" long.

The following described was turned up in an Oliver 12"x24" wood lathe equipped with a three jaw 6" diameter universal chuck. Speed 600 R. P. M. A ¼" round nose chisel was the only turning tool used.

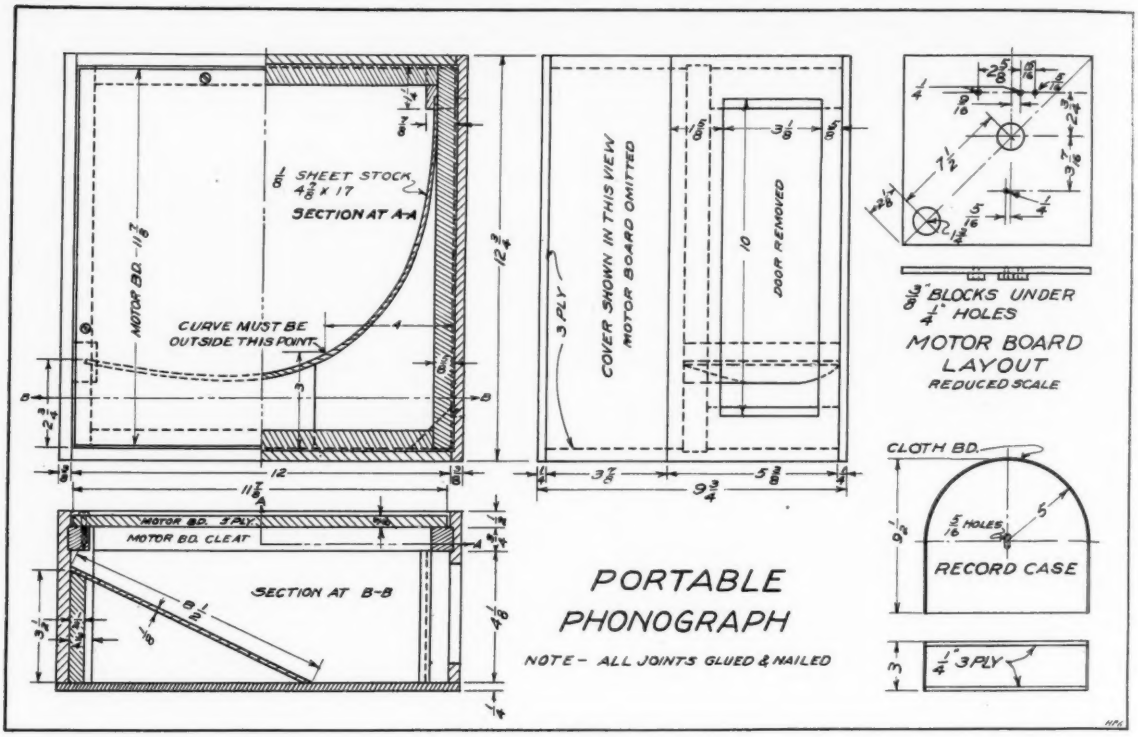
(1) Chuck up the stock good and solid and turn up as per drawing without the use of the tail center.

(2) Finish with file, sand paper, and steel wool.



BLACK DIAMOND EMERY WHEEL DRESSING TOOL

C. A. FLAGG.



Details for a Portable Phonograph.

(3) Thread handle end after stone is set.
(4) Turn top taper as in (A) after drilling.

Setting the Stone

Select a sharp corner for the exposed or cutting point. This must be left to the judgment of the maker. The life of the cutting edge will depend upon the correct selection.

(1) Caliper largest diameter of outside of stone and drill a hole of the same diameter and of such a depth that the cutting point of the stone is about flush with the top surface. Drop stone in place as in Figure B.

(2) With a nail set, or a blunt punch, start caulking the edge of the hole down. Work from the inside edge to the outside and repeat as many times as necessary. Care must be taken not to strike the diamond with the punch as they are very sensitive to a sharp blow. If, after setting, it is found that the stone does not project enough, a little stock can be removed from the top and the caulking repeated.

(3) Remove stock from chuck, and thread handle end. Turn suitable handle and bore a ⅜" hole to receive threaded end, inserting a little shellac into hole as this will help to keep it tight. A wood case can be turned to hold the dresser as shown in photo.

The above described dresser has been used on wheels from ½" face, 3" diameter, up to wheels with a 2½" face, 24" diameter. After dressing wheels the tool should never be plunged into water as this sudden cooling will cause the diamond to check. The diamond need not project over the metal for more than 1/32" after the caulking operation is finished. As the diamond wears down, the metal will also wear down. The life of a diamond with common care should be about ten years.

PORTABLE PHONOGRAPH

H. P. Gerber, Aberdeen, S. D.

As a junior-high-school problem this phonograph will prove more simple in construction than it appears from the photograph. It is being used as a regular class problem in a rural teachers' course in shop work. Most of the students are young women with no previous experience in shop work. We have found it easier to produce a finished piece having a genuine manufactured appearance with this project than with any other so far attempted.

The material used is fir ply wood which is strong and is the cheapest of all ply woods. The bent piece is basswood sheet stock. There are no difficult joints. The most difficult operation seems to be fitting the edge of the small sloping board in the amplifier to the curved piece.

The motor board is held in place with four round-head screws, two of which are shown in the top view.

The covering material is imitation leather cloth, sold by binders' supply houses. It is glued to the case with a special bookbinder's cold glue applied to the cloth with a heavy bookbinder's glue brush.

A stock list of the material and the order in which it is applied follows:

1 piece	5 x51¼"	outer edge of cover
1 piece	4 x48¼"	inner edge of cover
1 piece	11½x11½"	inner face of cover
1 piece	6½x51¼"	outer edge of case
2 pieces	12¼x12¼"	top and bottom
1 piece	13 x13"	motor board
1 piece	4¼x11½"	outside of door.
1 piece	2¾x 9½"	inside of door

Jigs for Bending Record Case.

Portable Phonographs Made by Mr. Gerber's Students.

1 piece 4 x26" outer edge of record case
2 pieces 9½x10" top and bottom of record case.

The motor used has a 10-inch turn-table.

The tone arm is a combination which has a universal reproducer.

After the motor and tone arm have been installed, the record case is placed in position as shown, so that the turn-table spindle engages with the slot in the record case.

In this position a hole must be made in the back of the record case to fit a small projection on the tone arm. By doing this the tone arm and record case are both held rigid for carrying after the lid is closed. All the metal trim can be applied by observing the photograph. The trim should be nickel plate in every instance.

One reason for making this phonograph is to encourage rural teachers to use music in various rural-school activities.

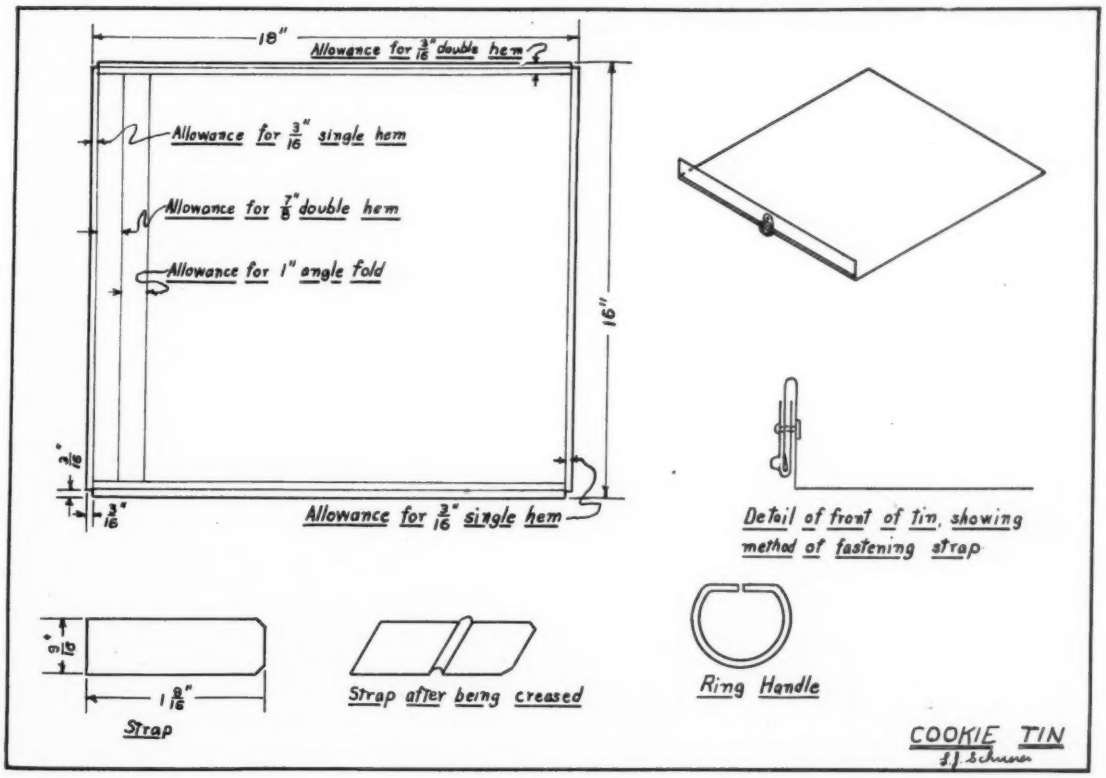
A COOKIE TIN

L. J. Schuerer, Manitowoc Vocational School, Manitowoc, Wisconsin

The cookie tin is an article appreciated in every home, especially at Christmas time when the baking of cookies is the paramount work of the kitchen. It is a good elementary project in sheet metal and I have used it as a shop problem in the Manitowoc Vocational School for several years. From the instructive standpoint it embodies cutting to size, notching, hemming, folding and riveting.

The metal used is IX bright tin. The ring handle is a ¾-inch commercial size, although it can also be made in the shop. Other dimensions can be used but this size has been found suitable for most ovens. A little space should be allowed all around the tin.

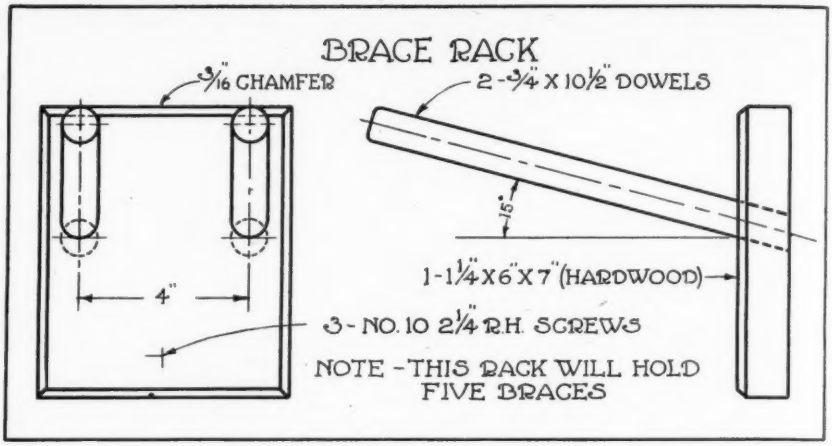
The first operation is to cut the metal to size, and have the corners notched. The next step is to single hem



Details of a Cookie Tin.

the long and the short edges, after which the long edges are double-hemmed. Care should be taken to hem in this order. One short edge is double hemmed and this is then folded back 90 degrees.

The ring strap is cut to size and the two corners cut off. The strap is then placed in the double hem of the front and marked. It is placed on the creasing stake and creased for the ring handle. The next operation is to place the strip in the front and with the ring in place, it is riveted to the front side.



FLOOR BRUSH RACK

Frank W. Dejmek, Instructor of Manual Arts, Algoma High School, Algoma, Wisconsin

In shops where the students are required to sweep, it is necessary to keep several floor brushes on hand for that purpose. The rack shown in the drawing holds six floor brushes, the handles of which can be drawn to the wall by a short cord or chain to keep them from swinging loose. By fastening the rack about eight or nine feet from the floor and drawing the handles to the wall the brushes are kept out of the workers' way and will remain in good condition to serve the purpose for which they were intended.

The iron angles brace the supports sufficiently to make the use of side braces unnecessary.

BRACE RACK

The brace rack saves a good deal of valuable space in a crowded tool room or tool board. It holds five braces very nicely, the inclined dowels preventing them from slipping off. The dowels should be glued and nailed from the back to prevent them from becoming loose.

RADIO MADE EASY

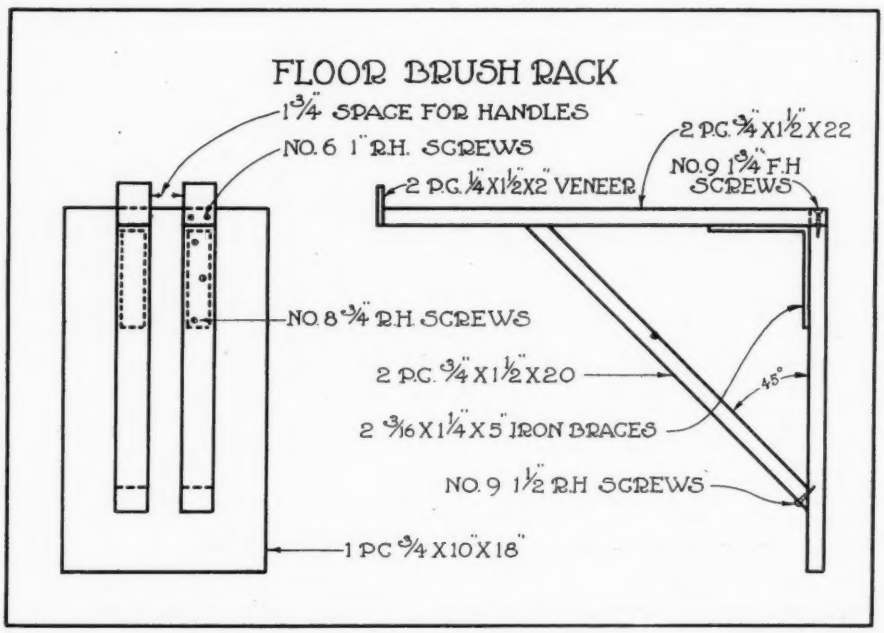
Louis Taylor, Manual Training High School, Brooklyn, New York

If you have felt that the making of a radio receiving set is too deep for you, here is a set which will disillusion you on that score. It can be made by any man or school boy of average intelligence in a few hours' time, and it will also prove to be an excellent school project, either for the shop or the radio club. An educational authority has recently stated that the making of radio sets fascinates boys, saves them from 40 to 60 per cent on the retail prices for complete sets, and also opens a large field for investigation and knowledge.

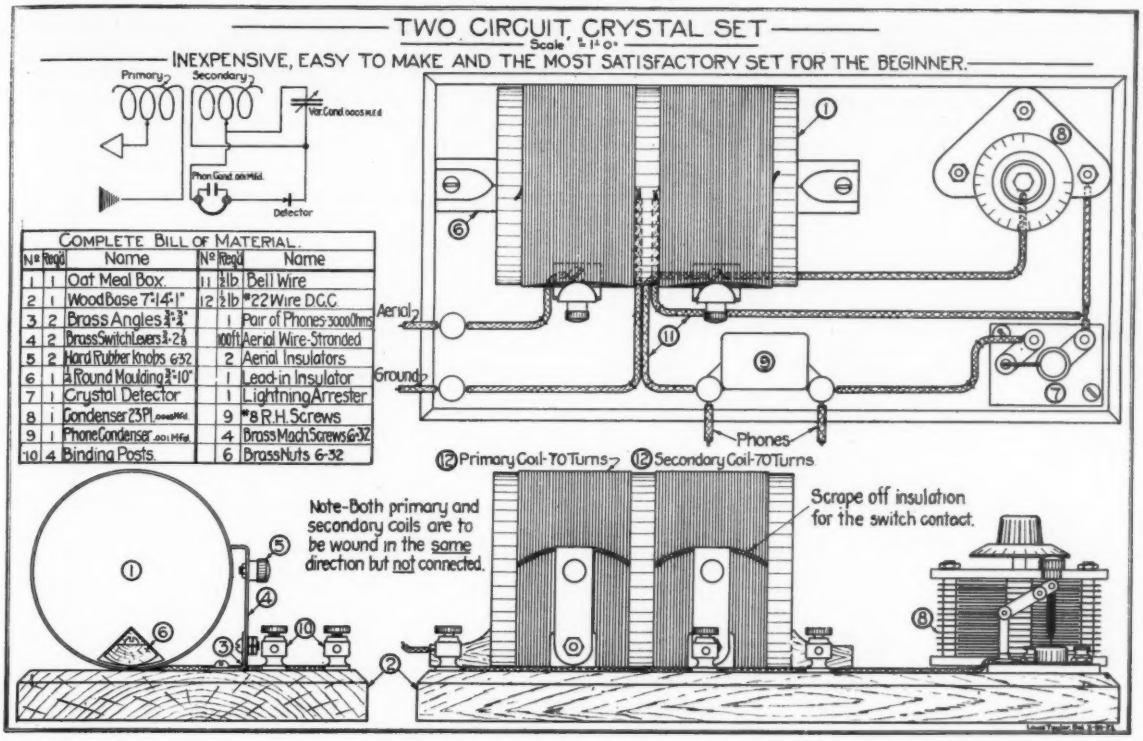
This set has a range of 25 miles and the two circuit and the variable condenser features make it possible to tune in the 360 to 490 meter stations and to enjoy the wonderful programs broadcasted by these numerous stations.

The total cost should be somewhere between seven and ten dollars, this sum will be sufficient to provide a good grade of material which is highly desirable. The only parts to be actually made are the tuning coils and the two brass angles and switches; the rest of the work is just a matter of assembling and wiring as shown on the drawing.

To make the primary tuning coil or coupler take an oat meal box and pierce holes in the side about one-half inch apart and about one-half inch from the bottom, thread the end of the No. 22 D. C. C. wire in one hole and out the other and bend the end over, now start the wiring, keeping it taut and close together. When you have seventy coils, pierce the box again in two places, thread wire in and out as before and cut the wire off about two inches from the box. Allow about one inch blank space on the box, repeat the wiring as before (in the same direction) for the secondary coil. Cut the box off about one-half inch from the end of the wiring and replace the cover of the box. Cut holes in the ends of the box as shown on the drawing for the hold down stick. Now give the whole box and wiring a light coat of shellac and hang it up to dry.


FLOOR BRUSH RACK
1 3/4" SPACE FOR HANDLES
NO. 6 1" R.H. SCREWS
2 PC. 3/4" X 1 1/2" X 22
NO. 9 1 3/4" F.H. SCREWS
2 PC. 1/4" X 1 1/2" X 2" VENEER
NO. 8 3/4" R.H. SCREWS
2 PC. 3/4" X 1 1/2" X 20
45°
2 3/16" X 1 1/4" X 5" IRON BRACES
NO. 9 1 1/2" R.H. SCREWS
1 PC 3/4" X 10" X 18"

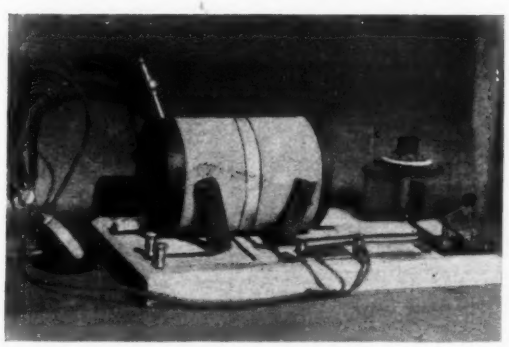
To make the angle supports for the switches you will need two pieces of strip brass ¾"x½". Bend the brass at right angles as shown on the drawing and drill a 5/32" hole


TWO CIRCUIT CRYSTAL SET
Scale 1" = 1' 0"
INEXPENSIVE, EASY TO MAKE AND THE MOST SATISFACTORY SET FOR THE BEGINNER.
Primary
Secondary
Var. Cond. 0005 M.F.d
Phon. Cond. .001 Mfd.
Detector
COMPLETE BILL OF MATERIAL.
Nº Reqd Name
1 1 Oat Meal Box.
2 1 Wood Base 7"·14"·1"
3 2 Brass Angles 3/4"·3/4"
4 2 Brass Switch Levers 1/2"·2 1/2"
5 2 Hard Rubber Knobs 6-32
6 1 1/4 Round Moulding 3/4"·10"
7 1 Crystal Detector
8 1 Condenser 23 Pl. .0005 Mfd.
9 1 Phone Condenser .001 Mfd.
10 4 Binding Posts.
11 1/2 lb Bell Wire
12 1/2 lb #22 Wire D.C.C.
1 Pair of Phones 3000 Ohms
100 ft. Aerial Wire-Stranded
2 Aerial Insulators
1 Lead-in Insulator
1 Lightning Arrester
9 #8 R.H. Screws
4 Brass Mach. Screws 6-32
6 Brass Nuts 6-32
Aerial
Ground
Phones
12 Primary Coil-70 Turns
12 Secondary Coil-70 Turns
Note-Both primary and secondary coils are to be wound in the same direction but not connected.
Scrape off insulation for the switch contact.

Details of Two Circuit Crystal Radio Receiving Set.

in the middle of each leg. To make the switches you both ends of each strip, drill 5/32" holes 3/8" from one end and 7/8" from the other end, bend up 3/8" of this end at right angles as shown on drawing, file off all sharp corners so that the switch will not cut the wires as it is moved over the face of the coil. Now join the angles and switches with a screw and two nuts each, as shown on the drawing, also screw on the hard rubber knobs as shown.

With this work completed you are now in position to start assembling the set. Pass the quarter-round moulding through the coils. Before screwing the ends down



The Set as Made by a Boy.

splice about a foot of bell wire to the end of the wiring of the primary coil, and also splice about a foot of bell wire to the beginning of the wiring on the secondary coil. Now screw down the ends of the quarter-round moulding, which will in turn fasten the coils or coupler to the wood base. Place a switch at the middle of each coil, and close enough to the coil to make a snug contact as the switch is moved across the face of the coil. When you have the correct position screw each angle to the wood base, next screw the condenser and the crystal detector to the wood base as shown on the drawing. Then screw in two binding posts for the phones, with a phone condenser between them. Next, screw in a binding post for the aerial connection and also one for the ground connection.

You are now ready for the wiring. Study the drawing and also the diagram very carefully, then proceed just as shown. Note that there is just one spliced wire in the hook-up; this occurs where the secondary wiring connects with the wire between the condenser and the detector. Also note that the beginning of the wiring on the primary coil, and the ending of the wiring on the secondary are left free.

Next, string the single wire aerial (100 feet if possible) with an insulator at each end, connect lead in wire with aerial and bring down to lightning arrester and from the arrester through the lead in insulator (which you may place in a hole drilled in the window frame) then connect with the aerial binding post, next run a piece of bell wire from the ground binding post to a water or steam pipe and be sure that your wire has a clean, bright contact with the pipe.

Now connect the phones to the binding posts, put on your head-set and you will be all ready for your first test. If luck is with you, some station within your zone may be on the air. To get a station, see that the "cat's whisker" is in contact with the crystal, then slowly shift the primary coil switch back and forth and a spot will be found where the signals come in the loudest. The next step will be to regulate the secondary coil switch so that it gives you a slightly louder signal. To do this, turn out all of the plates on the condenser and slowly shift the secondary switch until you strike the best spot. The condenser may then be adjusted for greater clearness. Of course it will take a little experimenting on your part to get the greatest efficiency out of the set. You will discover just where the most sensitive spot on the crystal is located and just how to place the "cat's whisker" on it, and you will also be able to locate the best points for your switches and condenser for each broad-casting station in your zone.

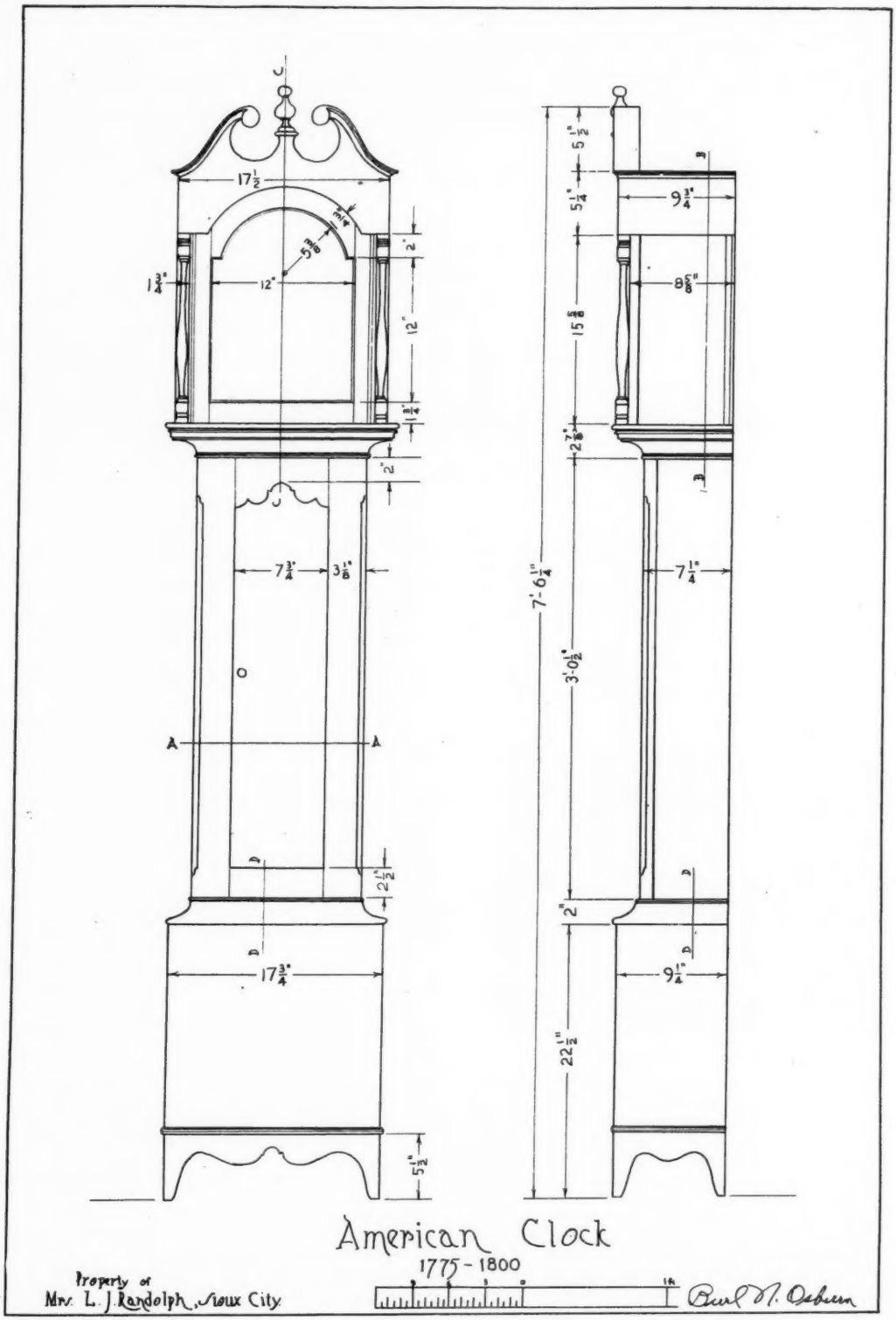
When you have reached this stage I am sure that you will experience a genuine thrill of satisfaction in having made a device which will not only be a source of enjoy-

ment to you but which will bring you into intimate contact with the most wonderful invention of modern times.

AMERICAN TALL CLOCK

Burl N. Osburn

The clock shown here was taken from an attic in a small Ohio town last year, and restored to usefulness. In common with many clocks of its class, it has had a very interesting history. When found, it was without works, but the dial and one hand gave a clew to its origin. The one hand, which was all it ever had, shows that it started as a shelf clock, undoubtedly of English make, somewhere around the years 1700-1720. About the time of the Revolution, an American cabinetmaker constructed a cherry case for it in the style of the day—which was quite the

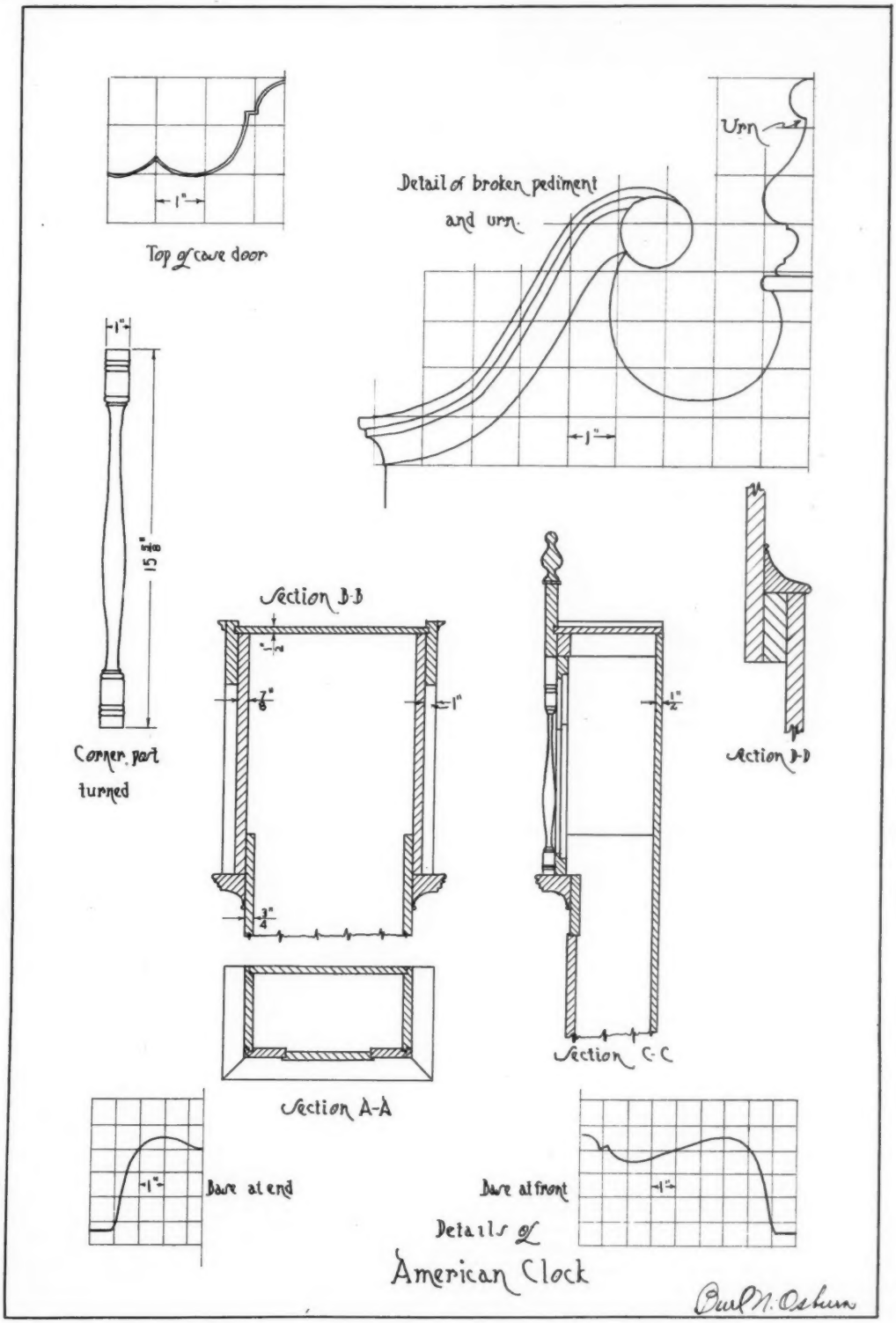


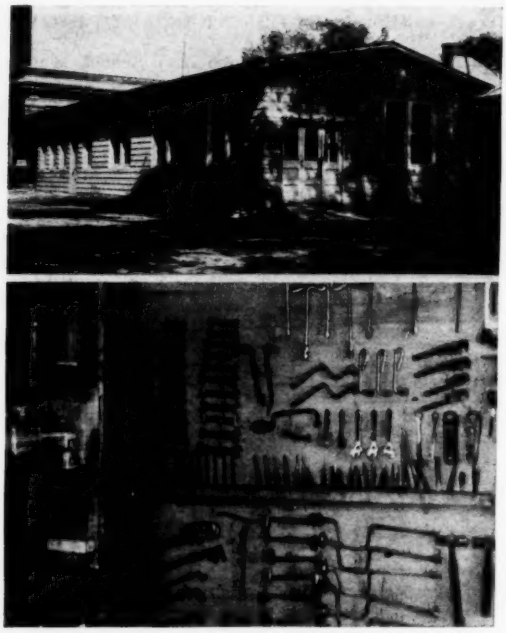
correct thing to do, judging from the number of similar cases. Its subsequent history is clouded but with a new finish, a new urn, and new works, its future is assured. Its construction, shown in the detail sheet, calls for careful fitting and accurate construction but the results are well worth the effort demanded.

TOOL-ROOM MANAGEMENT IN AUTOMOTIVE MECHANICS

James A. Hoskins, East Waterloo High School, Waterloo, Iowa

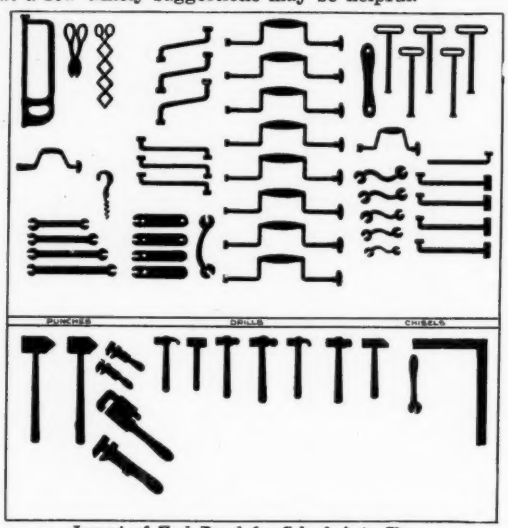
Convenient and systematic management and arrangement of tools in the auto-mechanics department should be as much a part of this course as it is in the library or





The Exterior of the Shop and One of the Tool Panels.

laboratory of our school system. If we observe various departments, however, conducted with needed tools piled in boxes or upon the benches, causing not only loss of time but teaching wastefulness and carelessness, it seems that a few timely suggestions may be helpful.

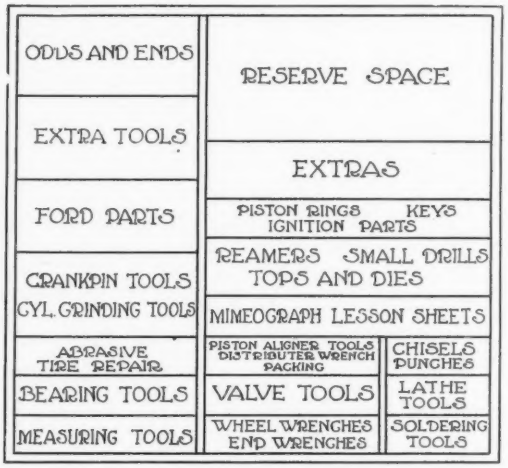


Layout of Tool Panel for School Auto Shop.

The following drawings illustrate a system which has been used very successfully in the East Waterloo high school and installed by the author at Stout Institute at Menomonie, Wisconsin.

It seems best to have each student have a definite number of days to take charge of the tool-room. At this time it is his duty, not only to supply the members of the class with the tools needed but to learn the names and uses of the same.

A simple check system of all tools loaned should be used. Four or five metal checks of each number should be secured for as many students as the shop will accommodate. Numbers used in roll-call should be used by each student during the semester when he draws tools. The tool man hangs the metal check on the hook or drops it into the drawer until the article is returned when the check is removed. Students are held responsible for all tools drawn and must return tools or keep them in their lockers if needed several days. The wall board should have hooks placed for tools which should be outlined with a contrasting color of paint with the longer wrenches at the top as shown in the drawing. Drawers and pigeon-



Layout for an Auto Shop Supply Cabinet.

holes should have containers for labels on the front of each with pieces of celluloid to prevent soiling of the labels.

A good color combination for the tool room is light gray walls with dark gray or green for the lower part, drawers, and tool board. Tool forms should be light on the dark board. The size and arrangement must necessarily be governed by the equipment and size of the shop and classes but these suggestions may readily be adapted for any up-to-date shop. Efficient work in the auto-mechanics deartment requires a definite place for everything and everything in its place in the management of the tool room.

NINE PIECE BURR.

E. M. Wyatt, Casper, Wyo.

This burr has for its key a piece that turns No. 6, Fig. 5. If snugly made, it is one quite difficult to dis-

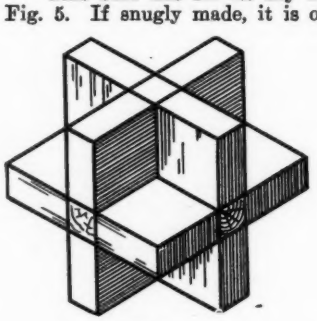


FIG. 1.

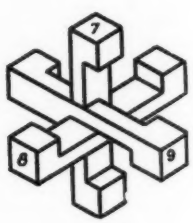


FIG. 2.

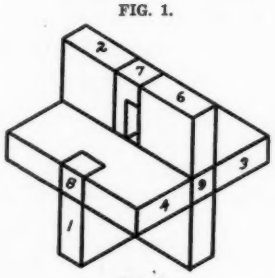


FIG. 3.

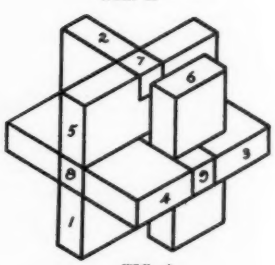


FIG. 4.

Parts of a Nine-Piece Burr.

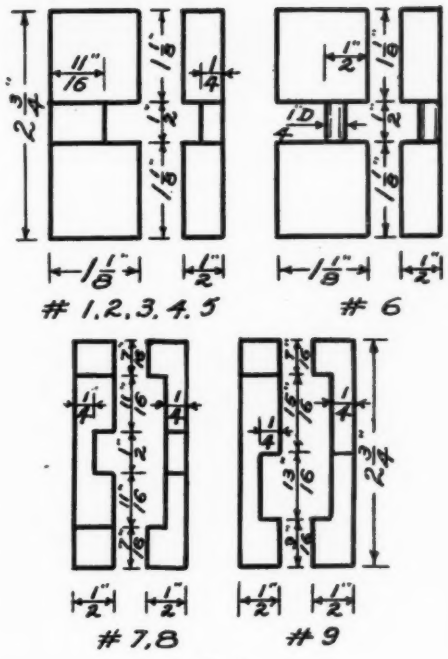


Fig. 5.

assemble, unless one is quite familiar with such puzzles. It looks well to make the square pieces of a different wood from the others.

Figs. 2, 3 and 4 show clearly the steps in assembling it. The key piece No. 6 is turned at the completion of the step shown in Fig. 3 to the position it occupies in Fig. 4. After all the pieces are in place No. 6 is turned back to the position it occupied in Fig. 3, or as in Fig. 1.

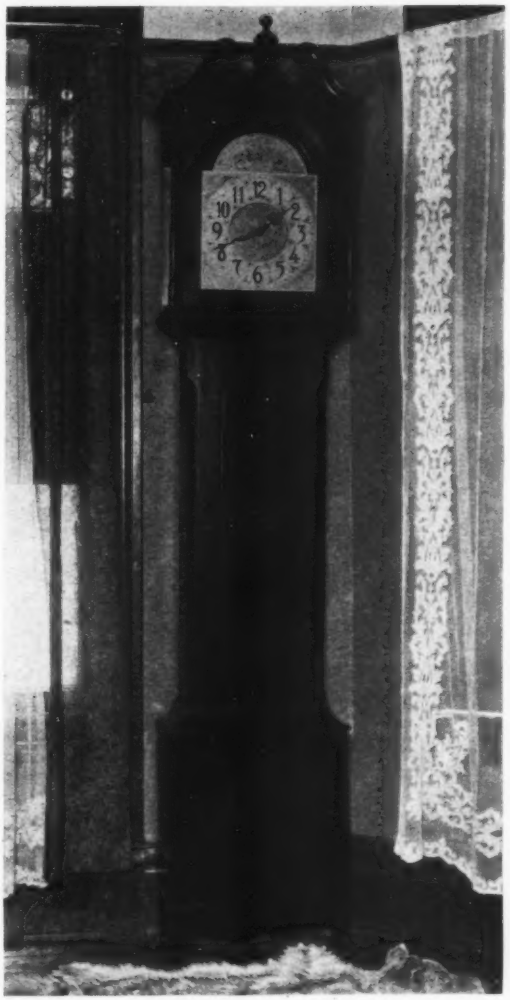
THE SPIRIT OF INDUSTRIAL EDUCATION

From every corner of this great state comes the boast of industrial educators and industrial schools that "productive work" is being turned out. We say a "boast," for it seems as though every director of vocational education wishes to have it understood that no foolish dawdling with impractical and useless projects is being tolerated in his organization. Strange to say, we scarcely hear a protest from the teacher who has been brought up on manual training aims and methods. Is it because every shop instructor is trying to outstrip the others in a mad race to make a showing in production work, or is it that they all have caught the spirit of the Smith-Hughes act and the demands of the times? We believe it is the latter. For there is a note of genuineness about the "boast," that is convincing. We believe in what we are doing; we insist on others about us believing it; and the public are coming to believe it can be done.

From far away Erie we hear of their machine shops turning out twelve-inch individual motor driven wood turning lathes in quantities of six to ten a year, while Chester, in the opposite corner of the state, reports a graduating class of fourteen machinists snapped up by the local industries.

Hazleton qualifies as a school shop producing center by building 24 workbenches of an improved type, and 36 teachers' desks. Pittsburgh is getting into the "productive basis" class at the rate of five hundred per cent increase in industrial school enrollment in three years' time.

Johnstown tells us of machinist's vises—fifty in number—a product all their own from the drawing room to the pattern shop and the machine shop. Williamsport is denied space to fully describe the products of the various vocational departments, except to merely mention that their trade students are designing and making patterns for an improved drafting table, with a cast iron base, which they



American Tall Clock. (See Pages 78 and 79.)

plan to build in quantities for the market, and their furniture making students are building $100 teachers' desks.

The Vocational Department of the New Kensington schools is turning out concrete block machines, rolling devices, for cinder block machines, and paper balers, as well as machines for their shop equipment.

The C. M. Schwab Industrial School at Homestead has a model apartment in which girls are taught cooking, laundering, weaving, and home making in a most practical way, even to making quilts, finishing them off in the good old-fashioned way with a quilting party.

Bethlehem, the city which has contributed so much to the fame of Mr. Schwab, has designed, patterned and built during the present school year 72 individual drawing tables, thirteen typewriter tables, thirty bench vises, 25 music stands, four double head pedestal grinders, thirty oak study tables, besides many other miscellaneous jobs with many other designs and patterns under way for lathes, drill presses, and other equipment for new schools to open up next year.

West Chester has the courage to teach real carpentry by building a house—not a toy, but an honest-to-goodness serviceable dwelling.

Allentown is building several thousand dollars' worth of school furniture. Altoona, York, Philadelphia and several other towns in the state, have been too modest to tell us of their specific accomplishments, but we hear they are moving along progressive and productive lines.

What does all this mean? It signifies that at last vocational educators are realizing the importance of training students by doing the real things in life. The exercise job and the miniature imitation structure are not found among the products of commercial industries. Why, then, should they have a place in the school shop when real projects are so plentiful?

Not only have we discovered that real jobs must be undertaken as instructional material, but that the best designs and methods of manufacture must be taught in order that the trained student may be up-to-date when he enters employment at his trade. The manufacturer today is constantly studying to discover a better method in manufacturing processes. The boy training to enter an up-to-date industry is ill prepared if he has not trained by up-to-the-minute methods.—*James C. Tucker, Director of Vocational Education, Bethlehem, Pa.*

BOSTON VOCATIONAL EDUCATION SOCIETY

Adelbert H. Morrison, head master of the Mechanic Arts school in Boston, spoke Saturday, December 15, at the December meeting of the Vocational Education Society of Boston. This luncheon and meeting in Healey's Hotel was attended by about fifty members. Discussing the topic "What training can the prevocational continuation and other schools give boys who intend to enter the Mechanic Arts high school?" Mr. Morrison cited the famous cartoon characters who were always depicted with the books "What to Do" and "Don't Do It". The speaker intimated that such schools should have as broad and varied opportunities as conditions warrant without special reference to preparation for technical high schools.

A survey was reviewed to show that 38.6% of M. A. H. S. graduates pursue further full time study; 31.6% are engaged in vocations closely related to work of M. A. H. S.; 11.2% are engaged in vocations slightly less closely related to the work of the school.

These figures seemed to justify, said Mr. Morrison, the conclusion that Mechanic Arts high school does not produce journeymen in the trades, but does produce engineers and does fit individuals for positions which Mr. Prosser has said are filled by "non-commissioned officers in industry."

Mr. Morrison suggested that the technical high schools would be free to do more efficient work if certain of their difficulties were obviated. The fact that certain boys have no mechanical aptitude should be determined in advance and such boys steered away from technical high schools.

Boys should not be encouraged to enter technical high schools when they have an inadequate foundation in mathematics.

Boys who have had no shop work or drawing constitute a problem when they are grouped with other boys who have had experience in such work. The elementary schools can help lessen the number who enter technical high schools with these handicaps.

Death carries greater poignancy and a severer shock when it comes with suddenness and at a time of the year associated with cheer and gladness. A marked air of solemnity and grief was apparent in the assemblage when it was called upon to hear the reports of sudden death and serious illness within the membership.

Mr. Edward C. Emerson, associate director of manual arts in the schools of Boston had prepared and presented a memorial to Mark A. Barney who died Tuesday, December 11. This memorial is printed herewith:

In Memoriam

It is with great sorrow that we must report the death on Tuesday last of Mark A. Barney, agent of the State Department of Education and an honored member of the association.

Mr. Barney was born in Belmont, New York, just a half a century ago, where he lived until he completed his public school training. He was a graduate of the Mechanics Institute at Rochester, New York, and attended both the Massachusetts Institute of Technology and Columbia University.

He was a master workman and excelled in his trade as a pattern maker. He followed his trade for fourteen years, rising rapidly to a foremanship.

As a teacher, he was two years at Mechanics Institute at Rochester, eleven years head of a department at the Newton Vocational School, and one year principal of the New England Vocational School, a Federal Board institution at Rutland.

Mr. Barney left Rutland two years ago to accept a position with the Commonwealth of Massachusetts as Supervisor of Trade and Industrial Schools for the Department of Education, following the sudden death of Mr. Allen. He has again followed Mr. Allen in a promotion which becomes, we thoroughly believe, a permanent position in joyful service.

The loss of Mr. Barney will be keenly felt throughout the state. His genial, forceful personality was increasingly making itself felt. The vocational schools of the state are already better for the influence he has been able to exert, even in two short years. We shall all miss his pleasant smile, his warm handclasp, and his tactful suggestions. He is gone, but he will be long remembered, and the bricks he built into the structure of vocational education will remain columns of strength as the building grows.

God's infinite goodness is not clear to those who are left on our little sphere, for it's hard to see the reason why unless we have faith. We must have faith to believe in the final good, in the Father who chastens, though misunderstood, that his children may profit and reach the goal of a perfect life.

In honor to our friend who has left us so suddenly in the prime of his life, and for a measure of comfort to his dear wife, I offer the following:

RESOLVED, that this Society learns with deep regret of the death of Mark A. Barney, and the members wish to express their sincere condolence and sympathy to Mrs. Barney in her sorrow.

And further be it resolved that this memoriam and resolution be spread upon the minutes and a copy sent to Mrs. Barney.

—JOHN I. LUSK.

DECEMBER MEETING OF THE SCHOOL CRAFTS CLUB

The New York School Crafts Club assembled for its third meeting of this school year on December 15th, at the Ethical Culture School. Our new president, Mr. Edwin F. Judd, gave the members an opportunity to assist in shaping the program of the club bv turning in written suggestions for topics and speakers. He feels the need of a personal interest on their part in this matter. The order for the evening was an open forum, business meeting, three round table discussions carried on at the same time, and a general review of subjects discussed.

Mr. George Dobbleaar opened up this question for discussion at the Forum, "Should Mid-Year Shop Examinations be given?" Mr. Frederick C. Arnold believes in giving both a practical and written test then to high school groups, and other written tests throughout the year as the teacher thinks he should check up on his pupils. Mr. Robert A. Campbell, state supervisor in industrial arts for New Jersey, called attention to the tests which Mr. Charles D. Parrick has had printed and which are being tried out in various schools. Written tests often show up the pupil to the teacher contrary to expectation. Mr. Parrick's tests follow the checking of correct answer method, with a choice of one in five or six questions.

At the business meeting it was voted to have printed the revised By-Laws and an up-to-date list of members. Vice-president Frederick C. Arnold read an "In Memoriam" resolution on the life of James Parton Haney, founder of the School Crafts Club, as compiled by a committee of which Mr. Lawrence J. Young is chairman. The sum of $25 was voted toward the Haney Scholarship Fund.

Mr. George F. Gettinger of the Hackensack, N. J., High School, led a round table discussion on "How Diversified Activities are carried on in a Composite Manual Training Shop." He told how in Hackensack the work evolved from whole classes turning out furniture for school purposes, an undertaking which exacted entirely too much preclass work on the part of the teacher. Later the making of toys for Red Cross use at Christmas time held sway, but still it was difficult to bring into use much of the metal working equipment that had been installed. Next they tried the project method in unadulterated form, with each pupil attempting to design an individual project. Here Mr. Gettinger found it took entirely too long to get things started, and the results were far from satisfactory. Much better work accrued when drawings of many well designed projects were made available in blueprint and book form for reference. Projects are governed by needs at home.

Mr. Gettinger found it possible to supervise work in which he was not previously skilled. He gave demonstrations of new processes involved in the making of projects and later called upon the most intelligent pupils to assist in giving individual demonstrations later as needed by slower pupils. He gave an instance of starting a fire in a forge. Very backward pupils are allowed to help others on projects and assist in keeping the shop in order. It is quite often the case that nearly all of a class can be interested in a given project. With a few projects much better results come than from too many. Three or four should be the limit in one class. At the beginning of each class Mr. Gettinger or his assistant is ready with a short talk or demonstration, on some subject allied with the projects at hand.

Mr. Kenneth McCullough, of the Evergreen School in Plainfield, N. J., spoke upon the "Teaching of Cement Work in the Seventh and Eighth Grades." Good points on this subject may be obtained from cement manufacturers and from the American Crayon Co. Waste wood may be used for forms. Mr. McCullough has found that cooking oils are better for oiling forms than linseed oil since they leave no stain. He also finds that mineral pigments for coloring the cement are likely to fade and has found Petroma colors very satisfactory.

The round table on "Educational Opportunities through the Teaching of Printing" was led jointly by Mr. Irving Daniels of the West Side School, Newark, N. J., and Mr. Richard Hillman of the Green St. School, Irvington, N. J. Fifty per cent of printing teachers do not seem to understand the possibilities in printing other than vocational aims. It may be correlated with other subjects in the curriculum. Mathematics can be used in figuring composition. Academic teachers are more than willing to help with a school paper for it gives them a chance to emulate those pupils doing good work in English, history, etc., by publishing their contributions. Mr. Daniels told how he used an illustrated alphabet in correlation with the art department. In the latter classes pupils designed the letters with a figure (as D, dog), and traced them on linoleum. These were printed on white paper with black ink in the printing room and returned to the art teacher for further decoration with colors in a study of color harmony.—**Lloyd F. Stair.**

WILL MEET AT DAYTON

The officers of the Western Arts Association have accepted an invitation from the Dayton school authorities to hold the 1924 convention in the city of Dayton, Ohio. The meeting will occur on May 6, 7, 8, and 9.

MR. WM. H. VOGEL,
President of the Western Arts Association,
Cincinnati, Ohio.
Mr. Vogel is preparing the program for the convention, May 6-9, and is leading in a big "On to Dayton" drive.

Complete arrangements are being made for the general and departmental sessions of the Association, and for an exclusive educational and commercial exhibit. The program committee is at work. The Ohio Arts and Manual Training teachers are engaged in an active campaign for a large turn-out.

INDUSTRIAL ARTS MEETING

The Industrial Arts Section of the Texas State Teachers' Association met on November 30th for two sessions. The first was opened by Miss Lizzie M. Barbour who spoke on the year's work in the state. Part-time education for women and girls formed the subject of an address by Mrs. Anna L. Burdick of the Federal Board for Vocational Education. Recent developments in day trade schools were presented by Mr. L. W. Fox of San Antonio.

At the afternoon session Dr. H. B. Works of Cornell University spoke on manual training as adapted to the needs of rural communities. Mr. Victor Smith of Alpine discussed a standard course for manual training and mechanical drawing. Mr. J. G. Groves closed the program of addresses with a paper on training teachers for mechanical drawing.

NEW JERSEY CONVENTION

The Vocational Education section of the New Jersey State Teachers' Association was held at South Side High School, Newark, New Jersey, December 27, 1923. Mr. Louis Wilson, Director of the Division of Vocational Education State of New York, spoke on "Recent Developments in the Field of Vocational Education." He spoke briefly of the new phases of vocational work which his department is now carrying on. He stressed the assistance rendered vocational work by the pre-vocational shop work of the Junior High Schools of New York state.

Dr. Edgar S. Barney, Director of the Hebrew Technical Institute of New York City, spoke on "Results of Forty Years of Technical Training." He traced the history of the Hebrew Technical Institute from its beginning up to its present efficient state. Mr. Barney explained many of the educational features which have made his institute famous and also the position in the technical world which the graduates of that school are now holding. —H. F. Fuller.

NEWS FROM MAINE

Most of the larger cities and towns of Maine have carried on Evening Schools in which Vocational classes were held. Director John F. Parker had very successful night classes in Electricity, Woodworking, Auto Repair, and Machine Shop Practice. An attendance record for the fall term of 100 per cent is the work accomplished by the Machine Shop Class. The other Industrial classes aim at Mr. Parker's record after the new year.

State Director E. K. Jenkins of Augusta spoke at the Annual Convention of the Print Club in Concord, N. H., recently.

Mr. Arthur S. Heath, special agent for the United States Fidelity & Guaranty Co., 41 Exchange St., Portland, Maine, has gone to considerable trouble to get data on a liability insurance which would give protection up to $5000 for one, and $10,000 for more than one person in the same accident. It was found that the rate would be $1.00 per 100 square feet in the shop and 8 cents per frontage foot if one wishes to be covered outside the shop. The minimum policy is $25. Many shop teachers are looking into this proposition and the Maine Society for Vocational Education is endorsing it.

The Spring Conference of the State Society will be held in Bangor about the middle of next May. Mr. C. A. Prosser of Dunwoody Institute and Mr. L. A. Wilson, State Director of Vocational Education in New York State, are expected to have places on the program.

PERSONAL NEWS NOTES

Mr. George H. Parkes has been elected director of vocational education at Williamsport, Pa., succeeding Mr. Yocum. Mr. Parkes is conducting an industrial teacher-training course for the Pennsylvania State College.

Mr. Forest Grant, head of the art department of the High School of Commerce, New York City, has been unanimously nominated for the position of Director of Art in High Schools, to succeed the late Dr. Haney.

Mr. Grant has been connected with the public school system of New York since 1914, during all of which time he has served in the High School of Commerce. Since 1921 he has been chairman of the department of drawing and commercial design in that school. He has had considerable experience in teaching in high schools and normal schools in the south.

Mr. Grant is a graduate of Chicago University and of the Chicago Art Institute and has taken courses at Teachers College and Columbia University. He received a B. S. degree from the latter institution in 1913.

A CORRECTION

Mr. F. M. Dannenfelser writes us as follows:

"In the November, 1923, issue of your paper I had an article entitled: 'A Practical Course in Sheet Metal Pattern Drafting' and under the title was printed 'An outline by F. M. Dannenfelser, Superintendent of the Industrial Training Department of Rehabilitation of Ohio State Board, Toledo, Ohio.' I think this title misrepresents my position and wish you would correct it somewhere in your paper in the next issue. This title should read: 'An outline by F. M. Dannenfelser, Superintendent of the Industrial Training Department, Toledo, Ohio,' but the course in sheet metal pattern drafting was written by me for the Ohio State Board of Education at the request of Mr. E. L. Heusch, State Supervisor of Trades and Industries."

NOW ARE THERE ANY QUESTIONS ?

The Making of Lamps and Lamp Shades

420. Q: We desire information pertaining to the making of lamps and lamp shades.—W.

A: The problem of finishing lamps involves nearly every known process of finishing metal and wood. The list below should give some information about the ordinary methods of making wood, metal and reed lamps, and the making of shades of various kinds:

Lamps—wood turned—Industrial-Arts Magazine, Feb. 1918, p. 77; Jan., 1917, p. 43; May, 1919, p. 194; Oct., 1916, p. 466; July, 1919, p. 284; Oct., 1917, p. 423; June, 1919, p. 245; July, 1916, p. 318; Feb., 1918, p. 509; Sept., 1916, p. 413; June, 1921, p. 231. Worst's Problems in Woodwork, $2.50, Bruce, Milwaukee.

Lamps — Copper and art metal — Industrial-Arts Magazine, July, 1916, p. 311; Feb., 1923, p. 75; Sept., 1915, p. 117; Aug., 1922, p. 322; Dec., 1914, p. 270. Googerty's Practical Forging and Art Smithing, $1, Bruce; Payne's Art Metal Work, $2.25, Manual Arts Press, Peoria, Ill.

Lamps—Glass, with metal or wood—Industrial-Arts Magazine, Jan., 1917, p. 43. Payne's Art Metal Work, $2.25, Manual Arts Press, Peoria, Ill.

Lamps—Wood and metal—Adams' Art-Craft Lamps, $0.25, Popular Mechanics Co., Chicago; How to Make Art-Craft Electric Lamps, Popular Electricity Publ. Co., Chicago.

Lamps—reed and fiber—Hyatt's Furniture Weaving Projects, $1.25, Bruce.

Lamps — Clay modeled — Industrial Work for the Middle Grades, Worst, $3.50, Bruce.

Lamp Shades—Silk—Industrial-Arts Magazine, Dec., 1919, p. 509; Sept., 1916, p. 414. Earle's Lamp Shades, $2.50, Dodd, Mead & Co., New York.

Lamp Shades—Art Metal—Industrial-Arts Magazine, July, 1914, p. 19.

Lamp Shades—Parchment and Similar Material—Industrial-Arts Magazine, Dec., 1919, p. 497; Sept., 1923, p. 356; Oct., 1923, p. 409. Worst's Problems in Woodwork, $2.50, Bruce; Parchment Shade Making, The Home Institute of Trades, Grand Rapids, Mich.

Lamp Shade Frames—Dragoo's Wire Lamp Shade Frames, $0.60, Bruce, Milwaukee.

Two-Tone Finish

426. Q: I have noticed several pieces of furniture with the "two-tone" finish on it. Would you please describe to me the method of applying this work? In my case the wood is walnut. Do you think it will be a finish that will remain, or is it merely a finish for a short time?

Several times when I have used linseed oil on walnut wood, and then applied shellac, I have found it hard to get the shellac to dry; what causes this, and how can it be remedied?—W. M. F.

A: First sponge, dry, and carefully sand the cabinet work. Make up a stock water stain, using this half strength for the entire piece. Let dry and restain those portions outside of the fine line generally used around the margins of tops and rails, etc., with full strength stain. Let dry, give a sizing coat of diluted orange shellac, dry, sand glass smooth with 6-0 paper. Filled effects vary from matched color fillers to white wax mixed with powdered rotten stone so as to give the so-called dusty walnut finish. The piece may then be shellaced with two pound clear gum solution and rubbed out in crude oil, pumice stone and felt pad or the shellac may be replaced with one or two coats of a very light bodied finished varnish now in vogue. These should be sanded between coats, the last being rubbed out in oil as described above in order to produce a very dull effect. This finish is one of the fancy types which will have but a few years' duration because of the lack of durability and thinness of protective material given the wood. This combination will soon give rise to a threadbare appearance within a short time.

You make a serious mistake in using linseed oil beneath shellac in the manner mentioned. A mixture of two parts turpentine and one part raw linseed oil together with one teaspoonful of japan drier per quart of mixture should be used to oil the walnut. I much prefer however, to use a water stain followed by a sizing coat of diluted orange shellac. This will give a clear, transparent effect beneath heavy or thin varnish coatings and avoids the muddy and uncertain effects of the oil method which requires at least a week for the drying of the oil coat.—**R. G. Waring.**

Commercial Art

427. Q: Just what is a "commercial arts establishment?" In what middle western cities are they to be found? What schools in the Middle West train young people to enter commercial arts establishments?—J. H. B.

A commercial artist is any one who prepares art work for advertising or other commercial purposes. Artists of this type usually limit themselves to making cover drawings and other illustrations for booklets, catalogs, newspaper and magazine advertisements; posters, street car cards, window display cut-outs and cards; signs for cartons, boxes, packages—in other words, anything that is used for industrial or commercial purposes, and that is reproduced by lithography, printing, photographing or any other method of multiple reproduction.

Commercial artists are generally classified as staff artists and as free lances. The free lance maintains his individual studio and accepts commissions from whatever source he can obtain them. Sometimes two or three artists form a partnership and work together, sharing rental and other expenses according to a private agreement.

So-called staff artists work for engraving firms, advertising agencies, large corporations which do considerable advertising, newspaper and magazine publishers, trade paper publishers, and commercial art firms.

1. The expression "commercial arts establishment" which you use in your letter undoubtedly refers to some of the so-called artists' firms which are either small corporations employing a group of artists or merely partnerships of artists doing commercial work. In the former case two or three of the artists probably have some good salesman for the group, own the business, and employ other artists to work for them. When the business is a pure partnership each man charges and is paid for his own work and simply shares the cost of bookkeeping, selling, rental, lighting, etc., on a percentage basis.

2. The largest establishments of commercial artists will be found in the large cities of the Middle West: Minneapolis, St. Paul, Milwaukee, Chicago, Detroit, Toledo, Grand Rapids, Cleveland, Cincinnati, Indianapolis, Columbus, St. Louis, Omaha, Kansas City, etc. There are also in these cities advertising agencies and publishers who hire one or more staff artists to do commercial work.

3. While a great many schools pretend to teach commercial art, there are comparatively few schools that can be classified as genuine vocational commercial arts schools. The best of these schools are,

The Chicago Art Institute, Chicago, Ill.

The Chicago Academy of Art, Chicago, Ill.

The School of Applied Arts, Battle Creek, Mich.

The Layton School of Art, 158 Mason St., Milwaukee, Wisconsin.

The Federal School Incorp., 15 South 6th St., Minneapolis, Minnesota.

The Minneapolis School of Art (?).

St. Paul Inst., School of Art (?).

My criticism on most so-called commercial art schools is that they are too commercial and not sufficiently artistic. By that I mean that they do not give their students a sufficiently thorough grounding in the general principles of art and in the underlying theories of design, composition, color, etc., but rather train for skill and making drawings for reproduction purposes.

As in other lines, the greatest success follows the best general art training. A young man or a woman who wants to make a big success in commercial art had better get the best possible general art education before he or she specializes in any one of the many phases of commercial art work.—**Editor.**

In India, too, the students use DISSTON Saws and Tools

Native wood turner in India at work on 1-boy-power lathe. Photograph from Mr. V. G. Krause, a friend of "Disston" in India.

The sun never sets on Disston Saws, Tools and Files. Wherever instruction is given in manual training, there you will find "The Saw Most Carpenters Use," chosen by men who know that the Disston name stands for service to their students and themselves.

From Balasore, India, comes this letter, written by V. G. Krause, principal of the Boys' Industrial School there:

"When I came here seven years ago I found the school using Disston Saws. Our sixty carpenters and boys are all supplied with Disston Saws and we also furnish them to local workmen.

"We intend to translate into the vernacular, for classroom work, portions of 'The Disston Saw, Tool and File Book' and other Disston Educational Aids. These books are being used in other schools in India, and are very useful."

The other books that Mr. Krause refers to are "The Saw in History," "The File in History," "The Pruning Book" and "The Lumbermen's Handbook." A complete set of these, together with the Disston Saw Chart and the Disston File Chart, will be sent on request to any one interested in manual training instruction. Address Dept. L

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NEWS AND NOTES

Plan Trade Courses. Mr. L. A. Wilson, director of vocational education for the state of New York, in November, held a conference with the bricklayers' and carpenters' unions at Watertown, with a view of opening trade classes in these industries. The unions have been most enthusiastic about the new courses and it is expected that they will begin early in the new year.

Vocational Evening School. At the Science Hill High School, Johnson City, Tenn., evening courses in mechanical drawing and blue print reading, automobile mechanics, home economics, and foreman teacher training are offered. The school is supported by funds from the national government and is under the immediate control of the board of education.

New Vocational Classes Started. Vocational classes in welding and blue print reading have been begun at Galveston, Tex.

Pupils Build Equipment. Anticipating the need of teachers' desks for a new school, the school board at Portsmouth, Va., has assigned the cabinet making class to the work of building ten quartered oak desks.

Auto Repairing School. A trade school in auto repairing is planned at the state highway department garage and storage plant at Portland, Conn. The center which is intended for the training of young men in tractor and large motor repairing is the fifth school of the kind in the country.

Federal Aid for Vocational Schools. Federally-aided vocational schools had a total enrollment of 536,528 students for the last fiscal year, according to a report of the Federal Board for Vocational Education. This is an increase over the preceding year, when 175,828 pupils were enrolled. A total of 5,700 vocational schools received federal aid in 1922-23. Of these, 2,673 were agricultural schools, with an enrollment of 71,298; trade and industrial schools numbered 1,634, with an enrollment of 325,889, and home economics schools numbered 1,393, with an enrollment of 139,341. The number of teachers in service in the government-aided vocational schools last year was 14,458.

Sheet Metal Course. A two-year sheet metal course is planned at Peoria, Ill.

Carpenters' School. The school board at Summit, N. J., has approved the establishment of a school for carpenters' apprentices. The school will be conducted under the provisions of the Smith-Hughes law, the city, state and federal government to share in the expense of the undertaking.

Blue Print Reading Class. A class in blue print reading for carpenters has been formed at the Ball High School, Galveston, Tex. The course is open to journeymen carpenters and is conducted under the provisions of the Smith-Hughes law.

Farmers' Short Course. A short course for farmer boys has been opened for its eleventh consecutive term at the Geneseo Township High School, Geneseo, Ill. The work is intended for farm boys who are compelled by their work to miss a part of the school year.

Cooperative Work and General Shop. At Jeannette, Pa., a general shop and cooperative work have been established in cooperation with the local industries. The cooperative course was established following an industrial survey, made with the assistance and under the direction of the State Education Department. The general shop is to be equipped for teaching wood working, electrical work, metal work and automobile repair.

Establish Trade Courses. At Monessen, Pa., day trade courses have been opened in the new junior high school. The shops provide for the teaching of carpentry, electric wiring and testing, and machine shop practice. The shops serve for both industrial arts and vocational instruction.

Industrial Survey. Supt. Charles Coxe of Lewistown, Pa., has begun an industrial survey of the industries of his district as a means of determining the need for vocational training. The work is being directed by the bureau of vocational education of the department of public instruction.

Evening Industrial Class. At Altoona, Pa., a new type of evening industrial class has been opened this year. A group of 56 men have entered upon a course in the practical phases of wall-paper hanging. The work was begun by the wall-paper trade, in cooperation with the local superintendent and the director of vocational education. The work is carried on in a frame house and covers practically five nights a week.

Establish Part-time Trade Course. At Waynesboro, Pa., part-time cooperative courses have been begun in the high school. Eighteen boys are employed for alternate two-week periods in the industrial plants of the city. Mr. J. A. Knupp, secretary of the local manufacturers' association, who has been active in promoting the project, gives part of his time to the work of coordinating.

New Castle Activities. The seventh and eighth grade boys of the Franklin Junior High School at New Castle, Pa., are printing a semi-weekly school paper. A vocational number was recently issued, giving information on practical arts and vocational industrial education. Automobile repair work has been begun with an enrollment of 22 students, and electrical work with an enrollment of 43 students.

Teacher-Training Class. An extension teacher-training class has been begun at Hazelton, Pa., under the direction of Mr. Fred Haegele, director of vocational education. The class is under the auspices of the Pennsylvania State College and is composed of members from a number of the nearby towns.

Industrial Arts Course. An extension course in industrial arts education is being conducted for the Bloomsburg Normal School. The work is under the direction of Mr. George Hutter,

(Continued on Page XXIII)

"Chats on Period Styles in Furniture"

is the title of a series of booklets to be issued by the American Wood Working Machinery Company for the benefit of teachers of cabinet making in the schools.

The first issue is out and pertains to Chippendale. The others will follow in turn and will be announced later as they are issued.

Teachers of woodworking will find this series of great interest to their pupils and valuable in their class work.

The first issue "Chippendale" is limited to 6000 copies. Teachers desiring copies for themselves and their pupils should send their request in early.

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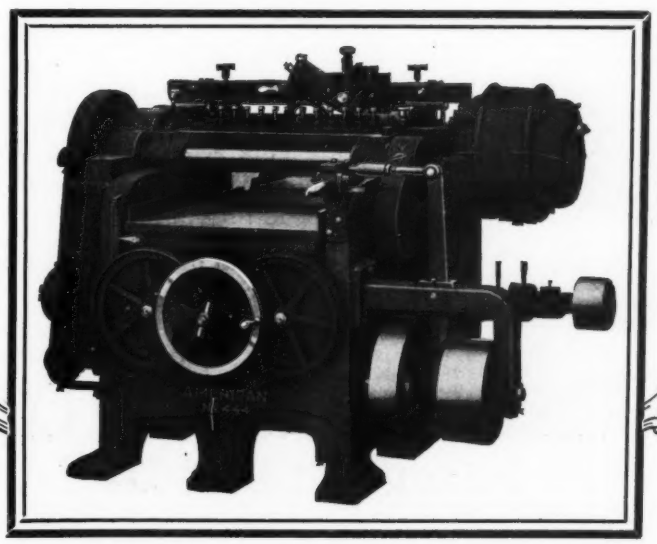

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Complete materials for weaving and finishing in a duo-tone enamel finish—$4.95.

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Here is an incentive for the student to do good work and put his training to a practical test.

Is it not logical to teach the student an Industrial Art that he may put to a practical use now? Something that he can make and sell and which will train him along business and commercial lines as well?

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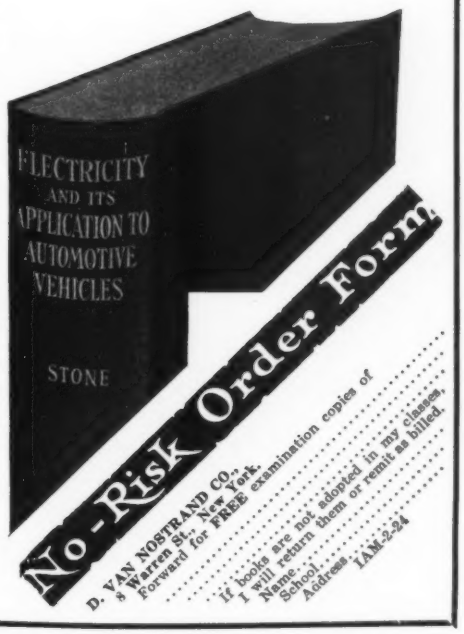

(Continued from Page XX)

head of the manual arts department of the Wilkesbarre high school.

Trade Courses. Mr. E. L. Bowman, educational director of plumbing and heating industries at Evansville, Ind., recently visited Harrisburg, Pa., for the purpose of creating sentiment for the establishment of trade courses in these industries.

The Federal Board for Vocational Education announces the engagement of Charles R. Allen for special research work with the Board for a period of three months beginning December 21, 1923.

This is the third winter that the Board has been able to secure the services of Mr. Allen, who is taking a temporary leave of absence from his regular duties at Dunwoody Institute to join the Federal staff. While in Washington, Mr. Allen will take an active part in the work of the special committee on Instructional Facilities and Standards which was appointed by the Apprenticeship Committee of the National Construction Council at its recent meeting in Buffalo. He will also cooperate with the staffs of the various services of the Board in an advisory capacity. Mr. Allen will continue as editor of the Department of Training in Industry of the Vocational Education Magazine.

Pupils Prepare Cook Book. Under the title of "delicious dishes" a cook book of more than a hundred pages, has been compiled, edited, illustrated, printed and bound by the pupils of the Empire Junior High School at Cleveland, O. In addition to scores of recipes contributed by the pupils in all classes of the school and approved by the cooking department, the book contains many clever verses and illustrations. The art work on the cook book was done by ninth-year pupils and the printing and binding by pupils in the SB sections. The initial edition was entirely sold out at the small cost of twenty-five cents a copy.

Pupils' Christmas Cards in Exhibit. Four years ago the supervisor of art, Miss Helen Fliedner, arranged for an exhibit of Christmas cards, to be made by the pupils in the junior and senior high schools of Cleveland, and to be shown at the Women's City Club. Since then, as each Christmas season arrives, the exhibit and sale of cards has been repeated at the club rooms. About sixty varieties of cards and calendars are included in the exhibit and club members and their friends purchase practically all of the cards available. The proceeds of the sale of cards go into the school fund.

A significant movement in the direction of farm shop activities is under way in the Oregon Agricultural College. The plans provide for the organization and equipment of a complete farm shop under the direction of H. H. White and in connection with the Corvallis high school.

Evening School Opened. The Murray Vocational evening school at Charleston, S. C., was opened in November, with an enrollment of 75 students. The school offers courses in sheet metal pattern, drawing, machine shop practice, electricity, metal shop practice, automobile shop practice, mechanical and architectural drawing, and shop mathematics.

Sheet Metal Course. A course in sheet metal to cover all branches of the work has been introduced in the high school at Bloomington, Ill.

Trade Training Grows in Favor. Trade or vocational training has grown in favor in El Paso, Tex. The aid given El Paso under the Smith-Hughes law is the largest received by cities in the state. Included in the proposed bond issue is an appropriation of $250,000 for a trade training and opportunity school.

Unite to Change Continuation Law. Educational and political leaders of Yonkers, New York, have united in a movement to modify the present part time school law. More than 1,000 boys and girls of Yonkers, between the ages of 16 and 18, are affected by the law which requires them to take time from their employment to attend school. Public sentiment from several directions has culminated in an attempt to have the state legislature modify the present law. It is pointed out that business firms and manufacturing establishments will not permit these young workers to take an hour off in the middle of the day, and yet the law does not permit the required work to be done at night or on Saturday. It means that there is being built up a class of young people, eager to work and not anxious for further schooling, who are antagonistic to enforced education and lack of employment.

Vocational Guidance. Special attention is being given at Chester, S. C., to the vocational needs of students who do not expect to enter college.

Vocational Work Introduced. With the opening of the new high school at Lancaster, N. Y., vocational work has been introduced and equipment installed. The class hour has been lengthened to sixty minutes.

Teacher-Training Class. The teacher-training class of the State Trade School, Meriden, Conn., has been reopened this year under the direction of the state vocational board. Instructors in the state trade schools at Bridgeport, Stamford, New Britain, Torrington, South Manchester and Meriden are chosen from among the men graduated from these training classes. The courses aim to prepare carpenters, electricians, draftsmen, masons and silversmiths for teaching positions in the state schools.

School Edits and Publishes Paper. The Training School of the State Normal College, at Dillon, Mont., which is also the public school of Dillon, has worked out an interesting project in English through the school newspaper.

There is but one master drawing pencil. Some day you will try it, and then, forever after, one name will come quickly to your mind when you think of the best pencil you have ever used . . And that name is Dixon's Eldorado.

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Write for full-length free samples of "the master drawing pencil" and of Dixon's "Best" Colored Pencils. In their field, Dixon's "Best" Colored Pencils hold the same position of supremacy as Dixon's Eldorado.

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Under the plan, the Dillon Examiner, a local daily, prints the paper. The 8A English class edits the material and publishes a four-page paper 8½ by 12 inches in size. Each grade in the school is interested in the work of preparing the paper and in the purchase of copies of the issue. The paper is an outgrowth of the language work of the school and its sale at the price of five cents a copy, makes the project self-supporting. The cost of printing the paper is estimated at $15 for 300 copies or $17 for 400 copies.

Health Poster Contest. The Hartford Tuberculosis Society at Hartford, Conn., has announced a second poster contest in the schools in which all pupils of the grades and high school are invited to participate. Each poster must bear a title dealing with the child and his physical environment as carried out in the "health creed."

Dedicate Detroit School. The Cass Technical High School, at Detroit, Mich., was dedicated November 27-28, with impressive ceremonies. The building which cost $3,000,000 is presided over by Principal Benjamin F. Comfort. Mr. Frank Cody is superintendent of schools.

School News Bulletin. The evening schools of Johnstown, Pa., under the direction of James Killius, have brought out a newspaper called the "Evening School News Bulletin." The publication outlines the vocational courses, and contains encouraging articles on adult education. In an introductory article, Mr. Samuel J. Slawson discussed the purpose and value of the evening schools.

Prepare New Courses. At St. Joseph, Mo., committees of teachers have completed the preparation of courses of study to supplement the regular courses. The art department under the direction of the art supervisor, conducted an extensive poster campaign. The work comprised display posters for window dressing purposes, attractive hand-colored cards for social affairs, banners and signs all made by the students. The enthusiasm of the children aroused much interest in the homes of the pupils.

Survey of Metal Industries. Mr. P. C. Molter, educational director for the National Metal Trades Association, Chicago, recently made a survey of the metal trade industries of Erie, Pa. The aim of the survey was to convince local employers of the need for trade education and the effect of fostering cooperation between the schools and the industries.

Establish Automobile School. An automobile school has been opened at Wilmington, Del., under the direction of Mr. W. K. Yocum. The school offers short, intensive courses in the various branches of automobile repair.

Adopts Cooperative Plan. A modified cooperative plan has been adopted at Chambersburg, Pa., for the training of apprentices in the industries. At present 48 apprentices from the five leading industries attend classes at the high school Saturday mornings from eight to twelve. The work is carried on through four hourly periods, one of which takes on the character of supervised study. Each apprentice is given the option of electing three of the subjects listed. An interesting feature of the work is the use of the Haggerty intelligence tests in determining the fitness of the men for the work. The local manufacturers who were especially interested in the tests, made use of the test scorings in giving due credit to those whose attainments were satisfactory. In some cases, the students were not only taken out of the school but were dismissed from the factory because they were deemed not adaptable to successful apprenticeship.

General Shops Planned. At Bethlehem, Pa., general shops are planned for the junior high schools. Under Mr. Walter, supervisor of vocational education, a number of industrial art features will be introduced.

Coatesville General Shop. A general shop has been installed in the Charles Street Junior High School, Coatesville, Pa., with the installation of six wood working benches. Additional equipment, including a sheet metal table, a tool wallboard, and other articles were made by the boys. In the working out of problems, usable dry-goods boxes and tin cans were utilized by the shop.

Carnegie Art Exhibit. The art exhibit of the Carnegie Institute, held in November, under the auspices of the associated artists of Pittsburgh was one of the best collections of paintings ever shown. In the exhibit, the group of works by the late R. M. Heppenstall was of unusual interest and importance. This collection of works, numbering 51, was a credit to the city. The paintings purchased by the One Hundred Friends of Pittsburgh Art, numbering 35 works, were another feature of the exhibit. The latter paintings were presented to and are owned by the Pittsburgh schools, and are a result of the pioneering work of John L. Porter for the promotion of art in the schools of the city.

Industrial Art Exhibition. The Annual Exhibition of Industrial Art was held in January, at the Metropolitan Museum of Art, New York City. The display of industrial art products affords American manufacturers and designers of furniture, textiles, and rugs a chance to avail themselves of the aids offered for improving the art standards of their outputs. Under the regulations of the Museum, the designs submitted must be approved by the museum authorities, must be made in America and must be manufactured during the year. The goods presented are not special pieces or isolated examples but are typical pieces manufactured in quantity in this country for public sale.

New Shop Rooms Proposed. With the completion of the new Penn High School at Harrisburg, Pa., the shop equipment now at the Technical High School will be moved to the new shops in the former building. At present the technical school has shops in printing, cabinet making, pattern-making, machine

(Continued on Page XXVI)

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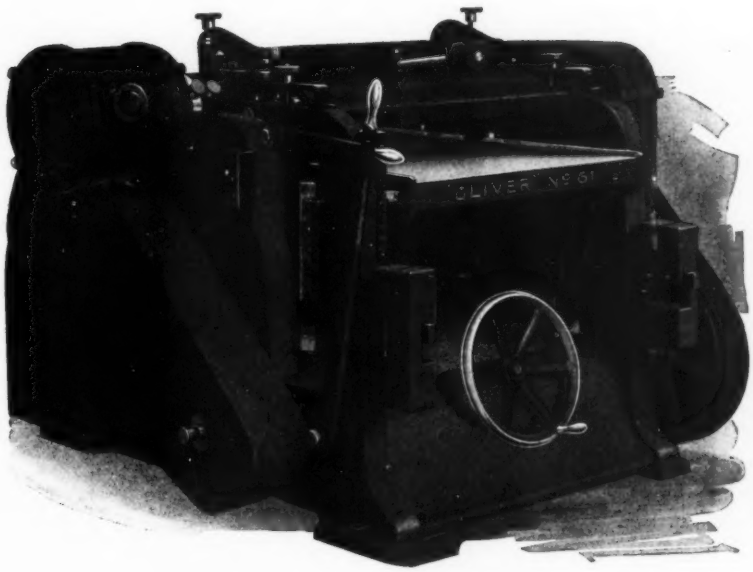

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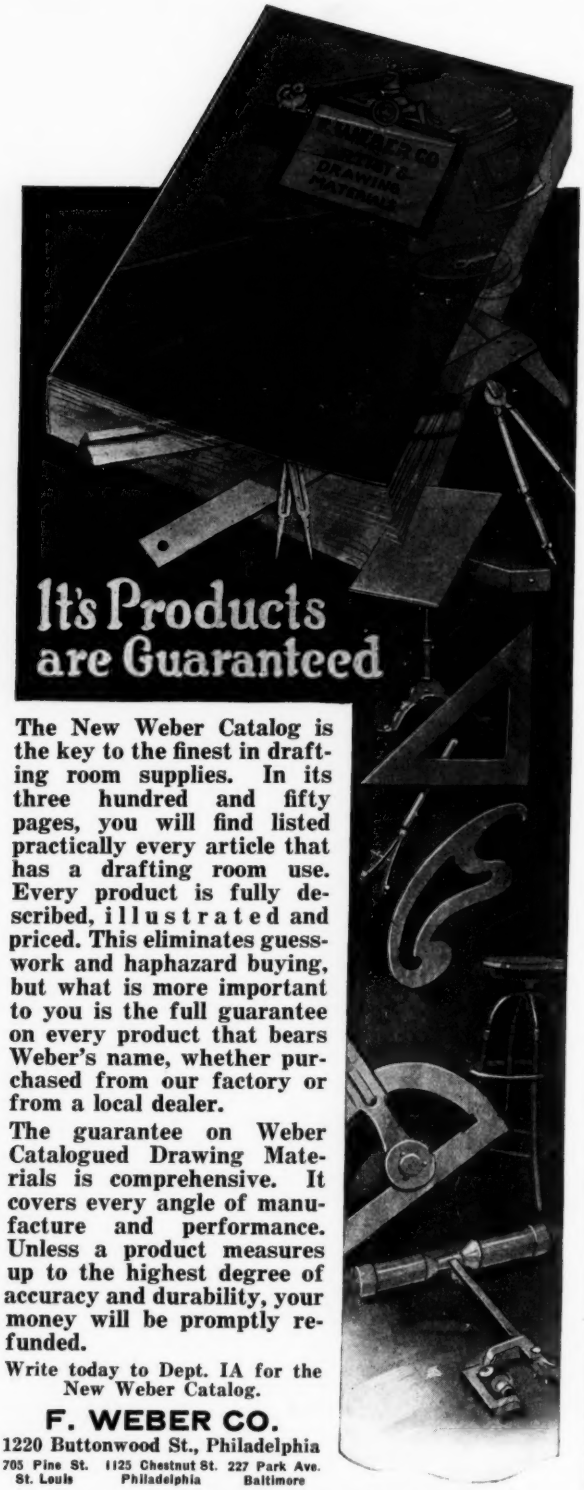

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(Continued from Page XXIV)

shop and electrical work, and automobile mechanics. Due to crowded conditions, not more than one-third of the school week is given to shop work. All of the shops are running extra periods before and after school hours to provide sufficient work in this branch. Mechanical drawing is required of all boys in the seventh, eighth, ninth, tenth, eleventh and twelfth grades.

Home Economics Work Reorganized. At Sistersville, W. Va., the home economics department of the high school has been reorganized under the Smith-Hughes Law. The board has approved plans providing for a sewing room, a fitting room, a unit kitchen, a laundry, a dining room, a living room, a bedroom and bathroom. The department at present accommodates 37 students and preparations have been made for accommodating an increased enrollment of pupils qualifying under the Smith-Hughes law.

Receives Gift. The manual training department at Sistersville, W. Va., was recently the recipient of a gift of $1,000 given by Mr. W. J. Neuenschwander, a public-spirited citizen interested in education. The money was used for the purchase of additional equipment for the use of the department.

Landis Students Build Homes. The students of the Landis Building Trades School at Chicago, Ill., have recently completed the erection of a two-story dwelling as a part of their work. The building which was erected in thirteen days' time has been inspected and found excellent in every respect, in fact a job worthy of the best in well-trained mechanics. The school has been in operation a little more than a year and has an enrollment which exceeds 350 students. Courses are offered in bricklaying, carpentry, painting, decorating, sheet metal work, plumbing and glazing and the entire work is under the direction of Mr. C. L. Bailey.

Dairymen's League Poster Competition. The Dairymen's League Cooperative Association of New York City recently held an exhibit of milk posters designed by talented art students in 28 high schools of Greater New York. The designs which emphasized the food value of milk were well executed, and showed much originality and freshness of viewpoint. The first prize of $50 went to a student of the High School of Commerce, New York, while second and third prizes of $35 and $25 respectively, went to two further students. It is planned to reproduce the prize-winning designs for distribution among schools, health organizations and welfare bodies.

Train Plumbing Apprentices. The Denver Plumbing Trade School for Apprentices, opened in November, 1920, with an enrollment of 35 students. Since 1921 the school has been affiliated with the Denver Opportunity School. At this time 44 students were enrolled with an average attendance of 24, and two passed the city examinations. In the third year there were 70 students with an average attendance of 40, four passing the city examination at the end of the year.

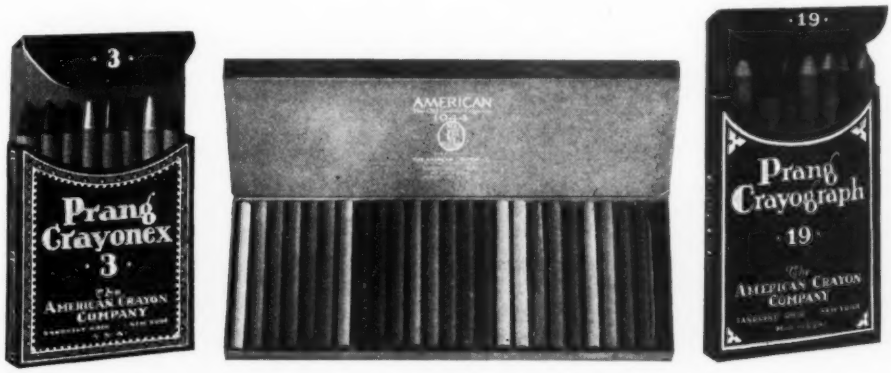
In the fourth year, the school enrolled eighty students with an average attendance of 45. Twelve students will be graduated this year. The work is under the direction of Mr. J. F. Van Daniker, chief instructor.

Praise Vocational System. In the opinion of the state director of vocational education of North Carolina, Rochester, New York has set the pace for the country in vocational education. Delegates to the convention of the National Society for Vocational Education who spent a day in Rochester, were lavish in their praise of the Rochester system. The delegation visited the Continuation School, the Boys' Prevocational School and the Madison Junior High School.

Vocational Work Described. The vocational work of the Rochester, New York, school system was recently described by Mr. James F. Barker, assistant superintendent of schools, in a talk given before the Master Plumbers' Association. Mr. Barker pointed out the difficulties of learning a trade through ordinary channels under present conditions, and showed that vocational classes are designed to correct this condition. He pointed to the building trades school in Chicago and urged the adoption of a similar plan in Rochester for the training of trades workers. Some trouble has been experienced in establishing apprentices' classes due to the requirement that there be at least ten applicants for classes and not less than thirty for conducting three classes.

Organize California Association. At the second biennial meeting of the California Teachers' Association, held at Sacramento in October, there was organized a Northern Association for the Advancement of Vocational and Fine Arts. The association adopted a constitution and by-laws and elected the following officers: President, L. F. Best, Sacramento; First Vice-President, C. C. Russell, Yuba City; Second Vice-President, M. O. Conger, Sacramento; Secretary, J. W. Hanson, Roseville, and Treasurer, L. C. Porter, Sacramento. J. W. McDonald and W. C. Morrison were elected members of the executive council.

Prize Competition in Economics. Mr. Alvan T. Simonds, of the Simonds Saw Co., Fitchburg, Mass., who is interested in economics, two years ago offered a prize of $1,000 to high school students writing the best essay on the teachings of Adam Smith and their application to present conditions. In this contest, the first prize was won by a student in one of the high schools of New York City and three of the prizes similarly went to New York City boys. This year an attempt has been made to get in touch with students and teachers all over the country in an effort to give every high school student the same advantages as the New York City boys in the first contest. This year it is planned to offer nine prizes. The contest which is open from December, 1923, to May, 1924, offers a first prize of $500, a second of $300, and seven further prizes of $100 each.



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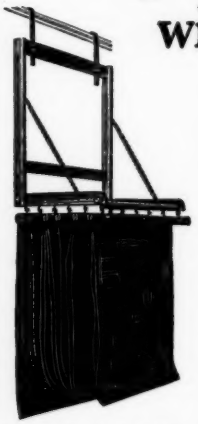

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TRADE PUBLICATIONS

Chats on Period Styles in Furniture. The American Wood Working Machine Company of Rochester, New York, has just prepared for free distribution a pamphlet on "Period Styles of Furniture" describing the life and the works of Thomas Chippendale. The pamphlet is extremely valuable because it presents the historic background which influenced Chippendale's monumental labors, and adds a rather complete description of the various features of Chippendale's work in both table and cabinet design. The booklet is one which every manual training and cabinet-making teacher will want to have for reference in his manual training work. The booklet is splendidly illustrated and will be sent free on request to readers of the magazine.

Announce Prize Essay Contest. Mr. Alvan T. Simonds of the Simonds Saw and Steel Co., Fitchburg, Mass., has announced the third economic prize essay contest for the promotion of the study of economics in high, normal and trade schools. Nine prizes are offered, including a first prize of $500, a second prize of $300, and seven other prizes of $100 each. The essays must be not less than 5,000 and not more than 15,000 words in length and they must be received not later than May 31, 1924.

Issue Catalog No. 19. E. C. Atkins & Company have just issued a new general catalog describing and illustrating the entire line of silver steel saws, saw tools, saw specialties, machine knives, grinding wheels, metal cutting machinery, etc. The catalog designated as No. 19 is stoutly bound in Caracul and is beautifully illustrated.

The appearance of an Atkins catalog is an event in the tool field. The present book is especially compact and condensed and easily accessible. It represents the results of sixty-six years of experience in the development of saws and tools which are famous the world over for quality and utility. The Atkins Company has always had as its slogan "Atkins always ahead," and has not used this slogan as a brace, but rather as an incentive to every man in the organization to produce scientifically correct and commercially useful saws and tools. The catalog will be sent to any reader of the magazine engaged in the lumber, furniture or woodworking business.

Oliver Catalog No. 22. The Oliver Machinery Company has just issued its 1924 catalog of machine tools and equipment for woodworking and metal working. It is designated as Catalog No. 22 and lists the complete Oliver line.

Much of the value of a catalog depends upon the ease with which items can be found by the busy prospective purchaser. The buyer of machine tools and shop equipment who has occasion to use this newest Oliver catalog will heartily appreciate its logical arrangement, the accuracy and completeness of illustrations and specifications, and the thorough attention to details which are probably not essential but which give a clue to uses and advantages of machines for various uses.

Shop teachers of woodworking, cabinet making, pattern making, machine shop practice, forging, turning, etc., will find the book a genuine mine of information and help in solving the problems of equipment. Copies will be sent to any readers of the Industrial-Arts Magazine.

TRADE PRODUCTS

Superior School Printing Outfits. Barnhart Brothers & Spindler have a genuine educational department and frequently surprise teachers and supervisors with novel and genuinely valuable material which aids in the organization and management of school printing classes.

Their latest contribution which has been prepared by Mr. F. C. Lampe consists of complete specifications of standard school printing outfits, for printing classes of varying sizes. The recommendations are specific and are based on three fundamental principles: (1) each outfit is selected for the best possible educational service, (2) full consideration has been given to the ability of school authorities to pay only a limited amount for outfits intended for small groups, (3) each article listed is of standard industrial type and is given in the school the same service that would be demanded of it in the commercial print shop.

The outfits include (a) body and shop type, (b) ornaments and borders, (c) spacing materials, (d) brass rule and accessories, (e) wood goods, (f) tools and miscellaneous equipment, and (g) machinery and accessories.

The outfits are intended for classes of 8, 10, 15, 20, 25, 30 and 35 students. The last two sets—for 30 and 35 students—are ample for the most extensive vocational work.

Readers of the magazine may obtain the standardized list by addressing the educational department of the firm at Monroe and Throop Streets.

Machine Shop Floor Plans. Proper location of machine tools in relation to the work to be accomplished is of prime importance in securing efficient production in industrial plants. It is just as important in the teaching of machine shop practice in the schools that the machine tools be properly located. The John Steptoe Company, Cincinnati, Ohio, now offers a service to supervisors and teachers that will materially assist in securing the proper placing of machine tools. Their engineering department will prepare without obligation floor plans showing a layout for a school machine shop provided the dimensions of the machine shop are submitted to them. The John Steptoe Company are manufacturers of Shapers and Milling Machine Lathes, having devoted special attention to the requirements of machine shops in schools for a number of years.

(Concluded on Page XXXV)

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(Concluded from Page XXVIII)

Trade Obituary

Death of Mr. Albert Fink Smith. Announcement has been made of the death of Mr. Albert Fink Smith, Vice-President of the Miehle Printing Press and Manufacturing Company, on December 4th.

Mr. Smith was connected with the Philadelphia office of the Miehle Company for thirteen years and was widely known in the printing trade.

The Philadelphia office of the firm will in the future be conducted by Mr. J. E. Eddy, who was formerly at the Chicago plant, but who has been associated with Mr. Smith in Philadelphia for several years past.

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